HeatTransfer

MODCON VWH

A MODEL OF CONSERVATION.

Installation Manual

MH27745
C UL US LISTED

CONTROLS
C SA US

member gama

- ***Installation***
- ***Startup***
- ***Maintenance***
- ***Parts***

Models
MODCON VWH 300 / LP / HL / LPHL
MODCON VWH 500 / LP / HL / LPHL
MODCON VWH 850 / LP / HL / LPHL

⚠ WARNING

This manual must only be used by a qualified heating installer/service technician. Read all instructions in this manual before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

NOTICE

Heat Transfer Products, Inc., reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch: do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be performed by a qualified installer, service agency or the gas supplier.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- **Do not try to light any appliance**
- **Do not touch any electric switch; do not use any phone in your building**
- **Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

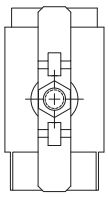
C. Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

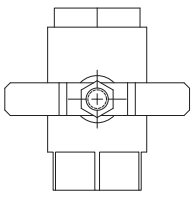
OPERATING INSTRUCTIONS

1. **STOP! Read the safety information above.**
2. **Set the thermostat to lowest setting.**
3. **Turn off all electric power to the appliance.**
4. **This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.**

GAS VALVE ON



GAS VALVE OFF



5. **Remove front cover.**
6. **Turn gas shutoff valve to "off". Handle will be across the piping, do not force.**
7. **Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.**
8. **Turn gas shutoff valve to "on". Handle will be in line with piping.**
9. **Install Front Cover.**
10. **Turn on all electric power to appliance.**
11. **Set thermostat to desired setting.**
12. **If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.**

TO TURN OFF GAS TO APPLIANCE

1. **Set the thermostat to lowest setting.**
2. **Turn off all electric power to the appliance if service is to be performed.**
3. **Remove Front Cover.**
4. **Turn gas shutoff valve to "off". Handle will be across the piping. Do not force.**
5. **Install Front Cover.**

LP-175 Rev. 4 3-11-08

CONTENTS

Part 1 – Product and Safety Information 4

Part 2 – Before You Start 6-8

Mod Con Recovery Ratings
Mod Con VWH Recovery Ratings with Storage Tanks
A. What's In The Box
B. How The Boiler Operates
C. Optional Equipment

Part 3 – Prepare Boiler Location 8-13

A. Boiler Location / Dimensions
B. Installations Must Comply With:
C. Before Locating the Boiler
D. Clearances for Service Access
E. Exhaust Vent and Intake Air Vent
F. Prevent Combustion Air Contamination
G. When Removing a Boiler from an Existing Common Vent System

Part 4 – Prepare Boiler 13-14

Part 5 – Boiler Piping 14-27

A. Relief Valve
B. General Piping Information
C. System Water Piping Methods
D. Circulator Pumps
E. Installation of Flow Switch
F. Scalding
G. High Velocity Circulator Pump
H. Boiler Piping Details

Part 6 – Venting, Combustion Air & Condensate Removal 28-38

A. Installing Exhaust Vent and Intake Air Vent
B. General
C. Approved Materials for Exhaust Vent and Intake Air Vent
D. Exhaust Vent and Intake Air Vent Pipe Location
E. Exhaust Vent and Intake Air Vent Sizing
F. Longer Vent Runs
G. Exhaust Vent and Intake Air Pipe Installation
H. Heater Removal from a Common Vent System
I. Diagrams for Sidewall Venting
J. Diagram for Vertical Venting

Part 7 – Gas Piping 39-43

A. Gas Connection
B. Gas Piping
C. Gas Table
D. Check Inlet Gas Pressure
E. Dungs Gas Valve

CONTENTS (CONT'D)

Part 8 – Field Wiring 44-51

A. Installation Must Comply With
B. Field Wiring Terminations
C. Field Wiring Considerations
D. Line Voltage Wiring for ModCon VWH
E. Alarm Connections
F. Low Voltage Connections for Standard Boiler
G. Tank Sensor or Mechanical Control
H. System/Pipe Sensor
I. Optional High Gas Pressure Switch
J. Optional Low Gas Pressure Switch
K. Flow Switch
L. Wiring of Cascade System Communication Bus
M. ModCon VWH Cascade Master Pump and Sensor Wiring
N. ModCon VWH Cascade Follower Pump and Sensor Wiring

Part 9 – Start Up Preparation 52-54

A. Single Mod Con VWH Boiler
B. Multiple Mod Con VWH Boilers
C. Check for Gas Leaks
D. Condensate Removal
E. Final Checks Before Starting Boiler
F. Cascade System

Part 10 – Start-Up Procedure 55-57

A. Operating Instructions
B. Adjusting the Operating Set Points of the VWH Display
C. Status Menu
D. Test Mode

Part 11 – Start-Up Procedures for the Installer 57-59

A. Programming for the Installer
B. Program Access
C. Program Navigation

Part 12 – Troubleshooting 60-63

A. Mod Con Error Code
B. Boiler Error
C. Boiler Fault

Part 13 – Maintenance 63-78

A. Maintenance Procedures
B. Combustion Chamber Coil Cleaning Instructions for the Mod Con
C. Maintenance Procedure to Clean Heat Exchanger

Inspection and Maintenance Start-Up Charts

PART 1: PRODUCT AND SAFETY INFORMATION

SPECIAL ATTENTION BOXES

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the product.

DEFINITIONS

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ CAUTION

CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

This appliance must be installed by qualified and licensed personnel in accordance with local codes, or in the absence of local codes, by the national fuel gas code, ANSI Z223.1-2002. This appliance is for indoor installations only. Clearance to combustible materials: 0" top, bottom, sides and back. Front must have room for service, 24" recommended. (A combustible door or removable panel is acceptable front clearance.) This appliance has been approved for closet installation. Do not install this appliance directly on carpeting. For installation on combustible flooring directly. Category IV vent systems only.

PART 1: PRODUCT AND SAFETY INFORMATION (CONT'D)

⚠ WARNING

Installer — Read all instructions in this manual, and Mod Con Venting section, before installing. Perform steps in the order given.

User — This manual is for use only by a qualified heating installer/service technician. Refer to User's Information Manual for your reference.

User — Have this boiler serviced/inspected by a qualified service technician annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

⚠ WARNING

Failure to adhere to the guidelines on this page can result in severe personal injury, death or substantial property damage.

⚠ WARNING

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.

CAUTION

You must not have a direct connection of the potable water system into the Mod Con VWH heat exchanger which could cause flow issues, short cycling and increase mineral build-up in the unit. The Mod Con VWH System is designed to have the incoming potable water flow through the storage tank first and then flow from the storage tank through the Mod Con heat exchanger. Failure to pipe the Mod Con VWH properly will void warranty.

BEFORE INSTALLING

WHEN SERVICING BOILER

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow boiler to cool before performing maintenance.

BOILER OPERATION

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control that has been under water.

CAUTION

Consider piping and installation when determining boiler location.

PART 2: BEFORE YOU START

MODCON RECOVERY RATINGS

WATER FLOW AT VARIOUS TEMPERATURE RISE																										
	20Δt	25Δt	30Δt	35Δt	40Δt	45Δt	50Δt	55Δt	60Δt	65Δt	70Δt	75Δt	80Δt	85Δt	90Δt	95Δt	100Δt	105Δt	110Δt	115Δt	120Δt	125Δt	130Δt	135Δt	140Δt
Model	**RECOVERY RATE IN GALLONS PER HOUR BASED ON TEMPERATURE RISE BETWEEN INLET TEMPERATURE AND OUTLET TEMPERATURE**																								
ModCon 300	1,692	1,354	1,128	967	846	752	677	615	564	521	483	451	423	398	376	356	338	322	308	294	282	271	260	251	242
ModCon 500	2,820	2,256	1,880	1,611	1,410	1,253	1,128	1,025	940	868	806	752	705	664	627	596	564	537	513	490	470	451	434	418	403
ModCon 850	4,794	3,835	3,196	2,739	2,397	2,131	1,918	1,743	1,598	1,475	1,370	1,278	1,199	1,128	1,065	1,009	959	913	872	834	799	767	738	710	685

MODCON VWH RECOVERY RATINGS WITH STORAGE TANKS

ModCon 300 VWH

Inlet Temperature	Outlet Temperature	Recovery Gallons Per Hour	First Hour Rating With 80 Gallon	First Hour Rating With 119 Gallon	First Hour Rating With 175 Gallon
40°	80°	846	906	935	971
40°	90°	677	737	766	802
40°	100°	564	624	653	689
40°	110°	483	543	572	608
40°	120°	423	483	512	548
40°	130°	376	436	465	501
40°	140°	338	398	427	463
40°	150°	308	368	397	433
40°	160°	282	342	371	407
40°	170°	260	320	349	385
40°	180°	242	302	331	367

ModCon 500 VWH

Inlet Temperature	Outlet Temperature	Recovery Gallons Per Hour	First Hour Rating With 80 Gallon	First Hour Rating With 119 Gallon	First Hour Rating With 175 Gallon
40°	80°	1,410	1,470	1,499	1,535
40°	90°	1,128	1,188	1,217	1,253
40°	100°	940	1,000	1,029	1,065
40°	110°	806	866	895	931
40°	120°	705	765	794	830
40°	130°	627	687	716	752
40°	140°	564	624	653	689
40°	150°	513	573	602	638
40°	160°	470	530	559	595
40°	170°	434	494	523	559
40°	180°	403	463	492	528

ModCon 850 VWH

Inlet Temperature	Outlet Temperature	Recovery Gallons Per Hour	First Hour Rating With 80 Gallon	First Hour Rating With 119 Gallon	First Hour Rating With 175 Gallon
40°	80°	2,397	2,457	2,486	2,522
40°	90°	1,918	1,978	2,007	2,043
40°	100°	1,598	1,658	1,687	1,723
40°	110°	1,370	1,430	1,459	1,495
40°	120°	1,199	1,259	1,288	1,324
40°	130°	1,065	1,125	1,154	1,190
40°	140°	959	1,019	1,048	1,084
40°	150°	872	932	961	997
40°	160°	799	859	888	924
40°	170°	738	798	827	863
40°	180°	685	745	774	810

PART 2: BEFORE YOU START (CONT'D)

Min Tank Size (gal.) = Required flow (GPM) x 10

Mixing factor→ $M_f = \frac{\text{VWH Outlet Temp}-40}{70}$

First Hour rating = $\left[\frac{\text{Total VWH Output x VWH Efficiency}}{\text{(VWH Outlet Temp-40) x 8.31}} + .75 \times \text{Total Storage} \right] \times M_f$

Example:

2 MOD CON VWH 500→ Total Output = 1,000,000 BTU @ 94% Efficiency
VWH Outlet Temp→140 °F
2 Storage Tanks (80 Gallon Each)→Total Storage = 160 Gallons

Mixing factor→ $M_f = \frac{140-40}{70} = 1.43$

First Hour rating = $\left[\frac{1{,}000{,}000 \times .94}{(140-40) \times 8.31} + .75 \times 160 \right] \times 1.43$

First Hour rating = $\left[\frac{940{,}000}{831} + 120 \right] \times 1.43$

First Hour rating = $\left[1{,}131 + 120 \right] \times 1.43$

First Hour rating = $\left[1{,}251 \right] \times 1.43$

First Hour rating = 1789 Gallons

A. WHAT'S IN THE BOX

Also included with the Mod Con are:

- Pressure and Temperature Gauge
- Installation Manual
- Warranty
- CSD-1 Form
- H-3 Data Sheet
- Intake/Exhaust Screen
- Supply and Return Thermistors
- Flow Switch and Fitting
- Wiring Harness
- System/Pipe Sensor

B. HOW BOILER OPERATES

Mod/Con Condensing Technology is an intelligent system that delivers highly efficient hot water heating, while maximizing efficiency by measuring the data parameters of your connected storage tank. Outlined below are the features of the system and how they operate:

1. **Stainless Steel Heat Exchanger** – The highly efficient Mod/Con Stainless Steel Heat exchanger is designed to use the cold return water from the system and extract the last bit of heat before it is exhausted.
2. **Modulating Combustion System** – The combustion system will modulate the output of the burner during operation to match the system demand and achieve the control set point while in operation. The set point can change by internal or external signals which enhance the overall performance of the system.
3. **Control** – The integrated control system monitors the system and regulates the fan speed to control the boilers output. This allows the boiler to deliver only the amount of heated energy required and nothing more.

   The control can regulate the output of multiple boilers through its cascade system function.

PART 2: BEFORE YOU START (CONT'D)

The cascade system is capable of connecting up to eight boilers together in such a way that they function as one boiler system. This allows for greater turn down ratios and provides systematic control of the multiple boilers in an installation to minimize downtime and maximize efficiency.

The cascade system works by establishing one boiler as the master and the other connected boilers as followers.

4. **System Display and Operation Led light Indicators** – The display allows the user to change the system parameters and monitor the system outputs. Led light indicators monitor system operation .
5. **Gas Valve** – The gas valve senses suction from the blower allowing gas to flow only if the gas valve is powered and combustion air is flowing.
6. **Swirl Plate or Venturi** – Controls the air and gas flow into the burner.
7. **Burner** – Constructed of high grade stainless steel, the burner uses premixed air gas and provides a wide range of firing rates.
8. **Spark Ignition** – The burner is ignited by applying a high voltage through the system spark electrode. This causes the spark from the electrode to ignite the mixed gas off of the burner.
9. **Supply Water Temperature Sensor** – This sensor monitors the boiler outlet water temperature (System Supply). The control adjusts the boiler firing rate so the supply temperature will match the boiler set point.
10. **Return Water Temperature Sensor** – This sensor monitors the boiler return water temperature (System Return). The control adjusts the boiler firing rate depending on how close the return water temperature is to the supply water temperature.
11. **Temperature and Pressure Gauge** – Allows the user to monitor the system temperature and pressure.
12. **Electrical field connections with terminal strips** – The electrical cover allows easy access to the line voltage and low voltage terminals strips which are clearly marked to facilitate wiring of the boiler.
13. **Condensation Collection System** – This boiler is a high efficiency appliance, therefore the boiler will produce condensate. The collection system has a float switch to monitor the condensate level to prevent condensate from backing up into the combustion system. There is a built in trap inside the collection system to seal the combustion system from the connected drain. The condensate should be neutralized to avoid damage to the drainage system or piping.
14. **Flow Protection** – The supplied flow switch is designed to protect the boiler in the event of low flow conditions. The boiler control will also monitor the flow through the heat exchanger by monitoring the return and supply sensor and will shut down the burner before overheating occurs.
15. **System Pipe Sensor** – The supplied System pipe Sensor is designed to be used in a Cascade System when the sensor is placed on the supply line of multiple boilers that feed the storage tank. This will control the temperature and modulate the firing rate of the connected boilers.
16. **Indirect Tank Sensor** (optional) – Used to monitor tanks l temperature.

C. OPTIONAL EQUIPMENT

Below is the list of optional equipment available for Mod Con Boiler.

- Indirect Tank Sensor (Part # 7250P-325)
- 4″ Stainless Steel Outside Termination Vent Kit (V2000)
- 6″ Stainless Steel Outside Termination Vent Kit (V3000)
- High and Low Gas Pressure Switch Kit with Manual Reset (Part # 7350P-600)
- U.L. 353 Compliant Low Water Cut-Off Interface Kit with Manual Reset (Part # 7350P-601)
- Alarm System (Part # 7350P-602) (to monitor any failure)
- Stacking Kit (Part # 7350P-603)
- PC Connection Kit (Part # 7250P-320)
- Boiler Caster Kit (Part # 7350P-604)
- Mod Con Condensate Neutralizer (Part # 7350P-611)

These additional options may be purchased through your HTP Distributor.

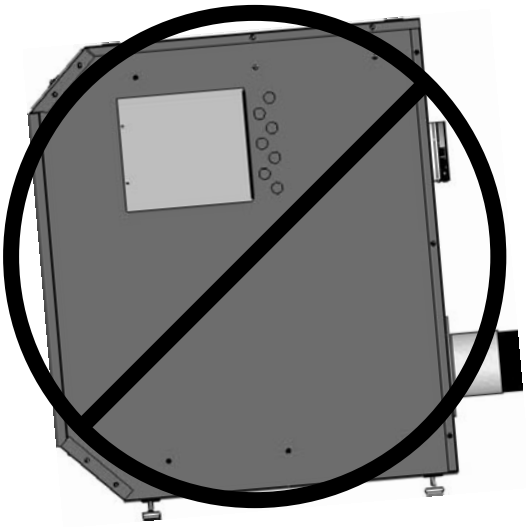
PART 3: PREPARE BOILER LOCATION

A. BOILER LOCATION / DIMENSIONS

Before considering the Boiler location, there are many factors that have to be addressed that are covered in detail in this installation manual. Please read the entire manual as it could save time and money. Piping, Venting, Condensation Removal are just a few issues that need to be addressed prior to the installation of the boiler.

⚠ CAUTION

When preparing the boiler location, make sure the area where you are placing the boiler is level. In order for the condensate to properly flow out of the collection system, the boiler must be level to assure proper flow direction. The Mod Con Boiler comes equipped with leveling feet. Should you find the floor beneath the boiler is uneven, adjust the leveling feet with a wrench.



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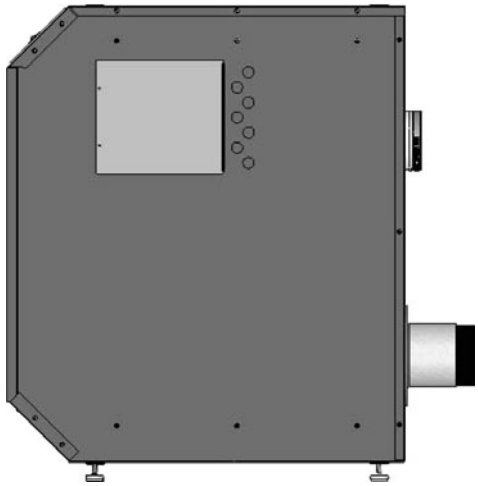
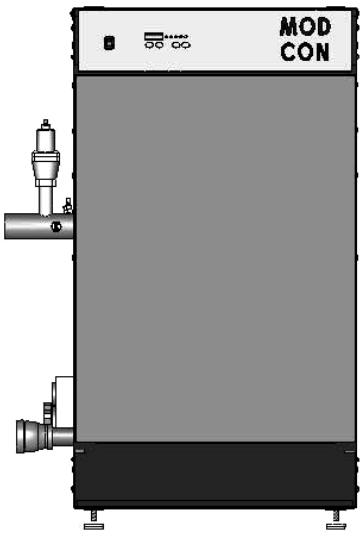


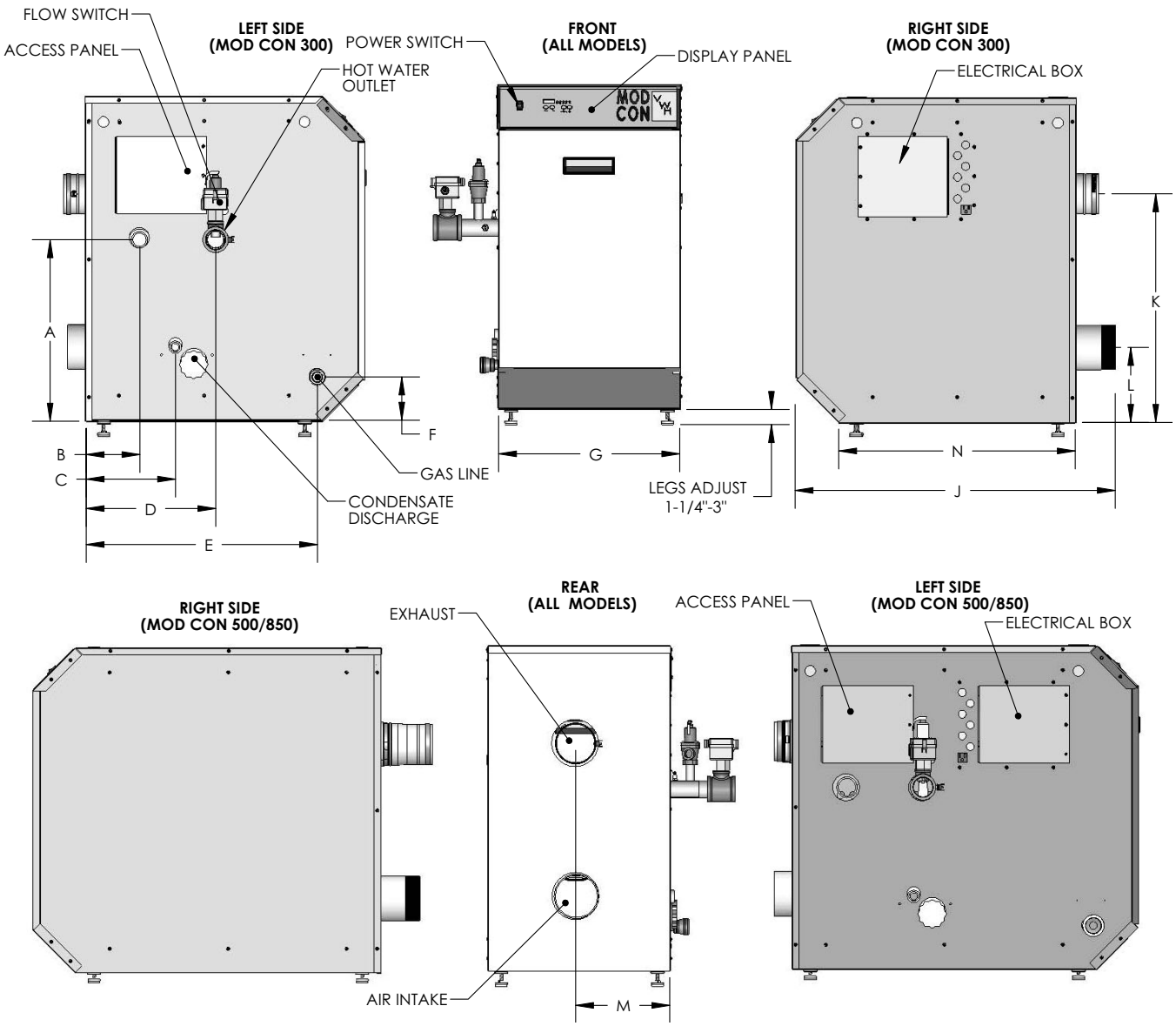
CORRECT

INCORRECT



CORRECT

DIMENSIONS



VWH MODEL	A	B	C	D	D	F	J	G	H	K	L	M	N
MOD CON 300*	20.00"	6.25"	10.25"	14.50"	26.00"	5.15"	35.75"	20.50"	36.00"	25.50"	8.25"	10.50	26.50
MOD CON 500*	20.00"	6.25"	13.25"	14.50"	33.30"	5.15"	41.75"	20.50"	36.00"	25.50"	8.25"	10.50	34.00
MOD CON 850*	20.00"	6.75"	16.25"	18.75"	43.50"	20.00"	66.75"	20.50"	36.00"	25.50"	8.25"	10.50	57.50

NOTE: ALL DIMENSIONS ARE APPROXIMATE AND HEIGHTS DO NOT INCLDE ADJUSTABLE LEGS.

***VWH DENOTES HOT WATER SUPPLY BOILER / LP DENOTES PROPANE / HL DENOTES HIGH/LOW GAS PRESSURE SWITCH.**

VWH MODEL	BTU/HR INPUT LOW FIRE	Gross Output BTU/hr	Net I=B=R BTU/hr	Thermal Efficiency	Boiler Water	Supply/Return Connection	Gas Conn.	Vent Dia.	Ship Wt.	High Fan Speed	Low Fan Speed	Fan Speed at Ignition
MOD CON 300*	60,000-301,000	283,000	245,000	94%	2.9	1-1/2"	1-1/4"	4"	410	5500	1250	3000
MOD CON 500*	100,000-500,000	470,000	409,000	94%	4.2	2"	1-1/2"	4"	505	6930	1250	3000
MOD CON 850*	170,000-850,000	799,000	695,000	94%	5.8	2"	2"	6"	580	5400	1500	3000

Figure 3-1

LP-205-C Rev. 6/23/09

PART 3: PREPARE BOILER LOCATION (CONTINUED)

B. INSTALLATIONS MUST COMPLY WITH:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1 – latest edition.
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required.
- National Electrical Code.
- For Canada only: B149.1 or B149.2 Installation Code, CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

NOTICE

The Mod Con Boiler gas manifold and controls met safe lighting and other performance criteria when the boiler underwent tests specified in ANSI Z21.13 — latest edition.

C. BEFORE LOCATING THE BOILER

1. Check for nearby connections to:
   - System water piping
   - Venting connections
   - Gas supply piping
   - Electrical power
   - Condensate drain
2. Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

⚠ WARNING

Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

3. The Mod Con Gas Control System components must be protected from dripping water during operation or service.
4. If the Mod Con Boiler is to replace an existing boiler, check for and correct any *existing* system problems such as:
   - System leaks.
   - Incorrectly-sized expansion tank.
   - Boiler is located in a condition that could cause the system and boiler to freeze and leak.
   - Clean and flush system when re-installing a boiler.

D. CLEARANCES FOR SERVICE ACCESS

1. See Figure 3-1 for recommended service clearances. If you do not provide minimum clearances shown, it might not be possible to service the boiler without removing it from the space.

SERVICE CLEARANCES

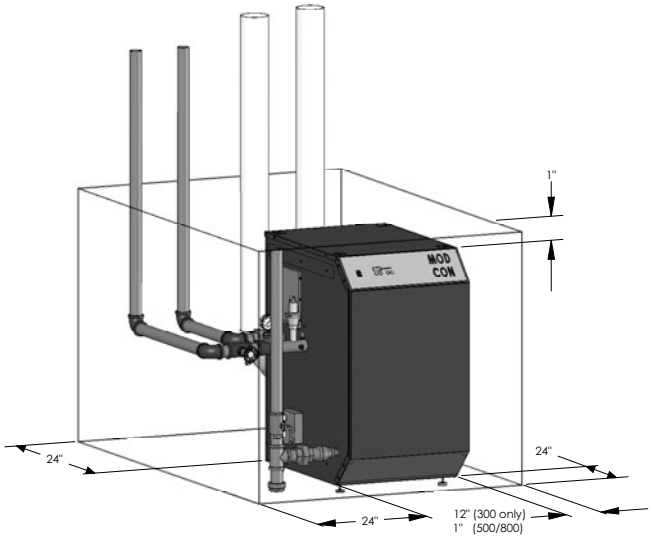


Figure 3-1 LP-205-M Rev. 5/27/08

⚠ WARNING

The space must be provided with combustion/ventilation air openings correctly sized for all other appliances located in the same space as the Mod Con Boiler. The boiler cover must be securely fastened to the boiler to prevent the boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to comply with the above warnings could result in severe personal injury, death or substantial property damage.

PART 3: PREPARE BOILER LOCATION (CONTINUED)

E. EXHAUST VENT AND INTAKE AIR VENT

⚠ WARNING

Vents must be properly supported. The Mod Con's Intake and Exhaust Connections are not designed to carry heavy weight. Vent support brackets must be within 1 foot of the boiler and the balance at 4 foot intervals. The Mod Con venting must be readily accessible for visual inspection for the first three feet from the boiler.

The Mod Con Boiler requires a special vent system, designed for pressurized venting. Mod Con Boilers are rated ANSI Z21.13 Category IV (pressurized vent, likely to form condensate in the vent).

You must also install air intake piping from outdoors to the boiler flue adaptor. The resultant installation is categorized as direct vent (sealed combustion). **Note: To prevent combustion air contamination see Table 3-2 in this section when considering exhaust vent and intake air vent termination.**

Intake and exhaust must terminate near each other and may be vented vertically through the roof or out a side wall. The intake and exhaust venting methods are detailed in the Venting Section. Do not attempt to install the Mod Con Boiler using any other means. Be sure to locate the boiler such that the air intake and exhaust vent piping can be routed through the building and properly terminated. The air intake and exhaust vent piping lengths, routing and termination method must all comply with the methods and limits given in the venting section.

F. PREVENT COMBUSTION AIR CONTAMINATION

Install intake air piping for the Mod Con Boiler as described in the Venting section. Do not terminate exhaust in locations that can allow contamination of intake air.

⚠ WARNING

You must pipe outside air to the boiler air intake. Ensure that the intake air will not contain any of the contaminants below. Contaminated air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage. For example, do not pipe intake air vent near a swimming pool. Also avoid areas subject to exhaust fumes from laundry facilities. These areas will always contain contaminants.

Table 3-2: Corrosive contaminants and sources

Products to avoid
Spray cans containing fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Antistatic fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Adhesives used to fasten building products and other similar products
Areas likely to have contaminants
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages and workshops

PART 3: PREPARE BOILER LOCATION (CONTINUED)

G. WHEN REMOVING A BOILER FROM AN EXISTING COMMON VENT SYSTEM

⚠ DANGER

Do not install the Mod Con Boiler into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death or substantial property damage.

⚠ WARNING

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

a. Seal any unused openings in the common venting system.

b. Visually inspect the venting system for proper size and horizontal pitch and determine that there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.

c. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

e. Test for spillage at draft hood opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.

f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.

g. Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 — latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Table 13 of NFPA54 ANSI Z223.1 2006 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

PART 4: PREPARE BOILER

⚠ WARNING

Uncrating Boiler – Any Claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

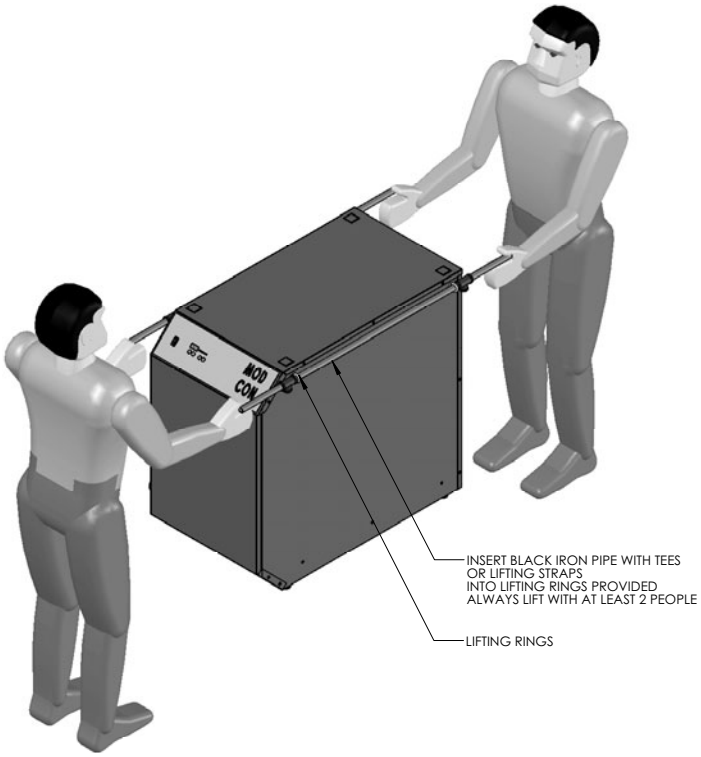
CAUTION

Cold weather handling — If boiler has been stored in a very cold location (below 0°F) before installation, handle with care until the plastic components come to room temperature.

Remove all sides of the Mod Con shipping crate in order to allow the boiler to be lifted into its installation location. You must pick the boiler up by the lift rings to avoid damage to the boiler

PART 4: PREPARE BOILER (CONTINUED)

enclosure. You can use either a solid ¾" in diameter black iron pipe or lifting straps to lift the boiler off of its shipping crate. You must have at least two individuals to handle the boiler properly to avoid damage as care should be taken as the Mod Con is very heavy. The Mod Con is also equipped with leveling feet that can be used to level the boiler properly if the surface location is not level. If surface flooring is rough, care should be taken when sliding boiler into position, you could catch the leveling feet and damage the boiler if it is slid to its location.


MOD CON
INSERT BLACK IRON PIPE WITH TEES OR LIFTING STRAPS INTO LIFTING RINGS PROVIDED ALWAYS LIFT WITH AT LEAST 2 PEOPLE
LIFTING RINGS

PART 5: BOILER PIPING

A. RELIEF VALVE

Connect discharge piping to a safe disposal location, follow the guidelines in the WARNING below.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation:

- **Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the valve discharge.**
- **Discharge line must be as short as possible and be the same size as the valve discharge connection throughout its entire length.**
- **Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.**
- **The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375 °F or greater.**
- **Do not pipe the discharge to any place where freezing could occur.**
- **No shutoff valve shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.**
- **Test the operation of the valve after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.**
- **Failure to comply with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.**

PART 5: BOILER PIPING (CONTINUED)

B. GENERAL PIPING INFORMATION

NOTICE

The Mod Con Boiler control module uses temperature sensors to provide both high limit protection and modulating temperature control. The control module also provides low water protection by sensing the water flow through the flow switch on the heat exchanger. Some codes/jurisdictions may require additional external controls.

C. SYSTEM WATER PIPING METHODS

Expansion tank

1. Ensure that the expansion tank size will handle boiler and system water volume and temperature. Allow for boiler, piping and storage tank:

Boiler Water Volume

Mod Con 300 VWH	2.9 Gallons
Mod Con 500 VWH	4.2 Gallons
Mod Con 850 VWH	5.8 Gallons

CAUTION

Undersized expansion tanks cause system water to be lost from relief valve. Eventual boiler failure can result due to excessive make-up water addition. This type of failure is NOT covered by warranty.

2. The expansion tank must be located as shown in Boiler Piping Part 5 or following recognized design methods. See tank manufacturer's instructions for details. Always install an expansion tank designed for potable water systems.

D. CIRCULATOR PUMPS

⚠ CAUTION

DO NOT use the boiler circulator in any location other than the ones shown in this manual. The boiler circulator is selected to ensure adequate flow through the Mod Con Boiler. Failure to comply could result in unreliable performance and nuisance shut downs from insufficient flow.

⚠ WARNING

Plumbing of this product should only be done by a qualified, licensed plumber in accordance with all local plumbing codes.

The Mod Con VWH is designed to be connected to a storage tank to supply domestic hot water. Heat Transfer Products has available storage tanks that are 80/119/175 gallon size storage tanks constructed in either Stainless Steel or Glass lined construction. These storage tanks will be directly connected to the Mod Con VWH supply and return connection. Connect the cold water supply to both the storage bottom port and the supply side of the Mod Con VWH (shown in Piping details, this section) It is important that you install a flow check on the supply line of Mod Con VWH before you connect feed line to the storage. This will allow the cold feed to flow through the storage tank first and not the Mod Con VWH. It is recommended that you install shut off valves on the cold feed line for ease of future service. If there is a back flow preventer, or any type of no return valve in the system, then you must install an additional tee for a suitable potable hot water expansion tank. Connect the Storage tank return line to the return connection located on the Mod Con VWH (shown in Piping details, this section). Then connect your hot water outlet located on the storage tank to your hot water plumbing lines.

PART 5: BOILER PIPING (CONTINUED)

⚠ WARNING

Never use dielectric unions or galvanized steel fittings when connecting to a stainless steel storage tank or boiler.

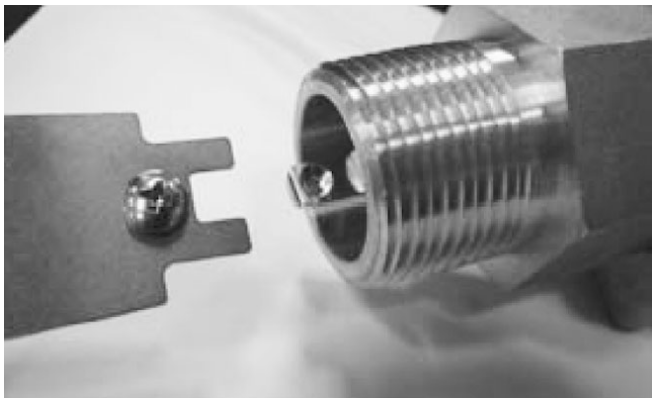
⚠ WARNING

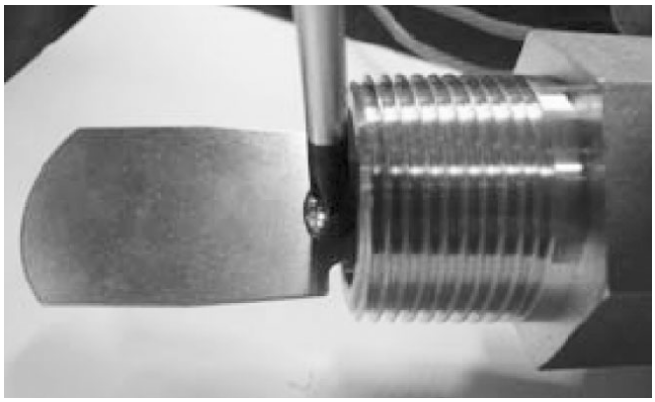
When raising tank temperature, you increase the risk of scalding – Please use a water tempering or mixing valve and extreme caution. Consult codes for conformance.

E. INSTALLATION OF FLOW SWITCH

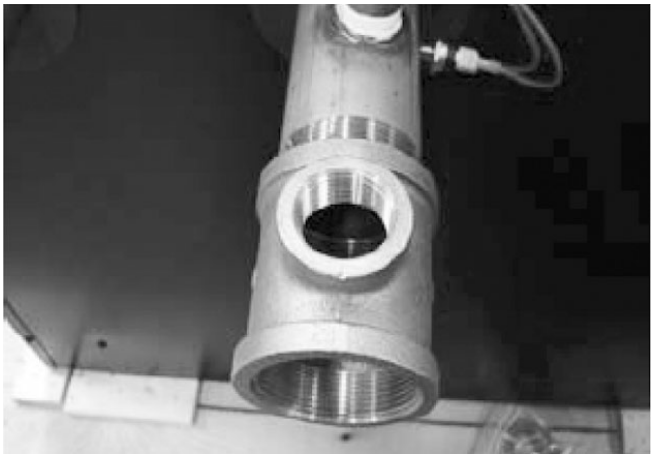
Note: If you are converting the Mod Con boiler to VWH you will follow steps 1-9. If you have purchased a factory Mod Con VWH you will only need fo follow steps 1, 2, 3 and 8.

1. Attach flow paddle as shown:

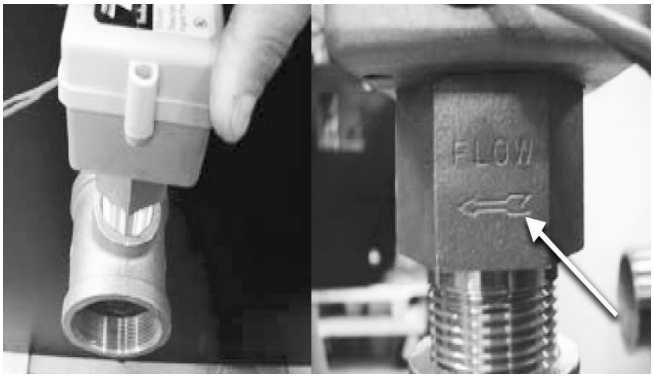




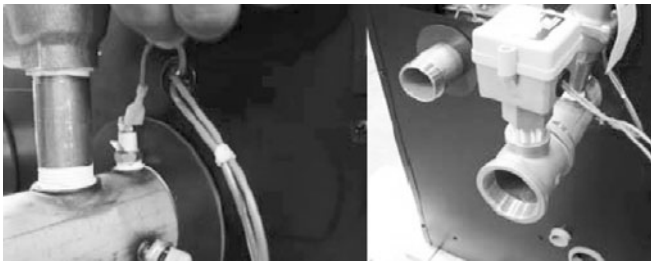
2. Thread brass Tee into outlet nipple using pipe dope:



3. Thread switch into Tee using pipe dope, making certain the Flow Arrow points in the correct direction:

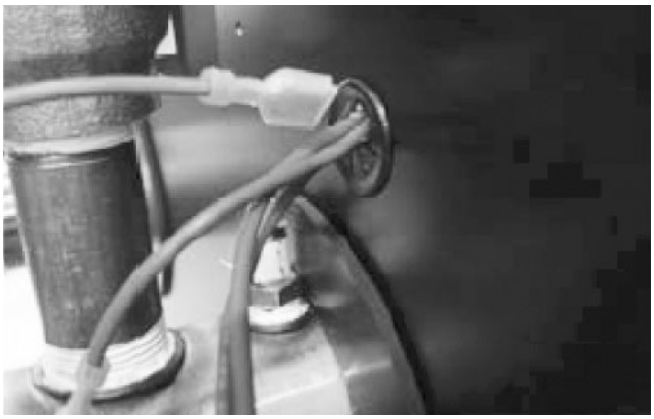


4. Disconnect red wire on the Low Water Cut off Probe and connect it to the red wire from the wire harness (included in kit):

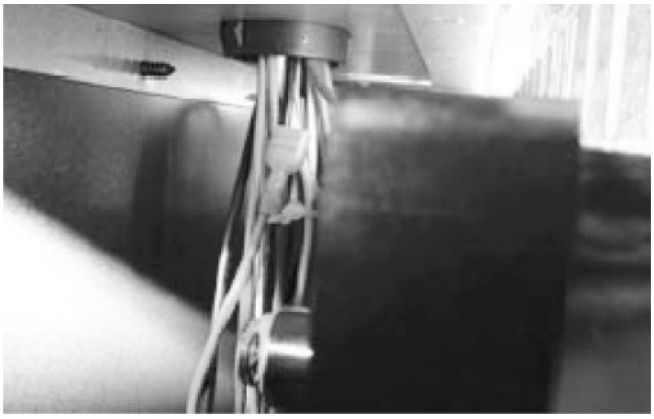


PART 5: BOILER PIPING (CONTINUED)

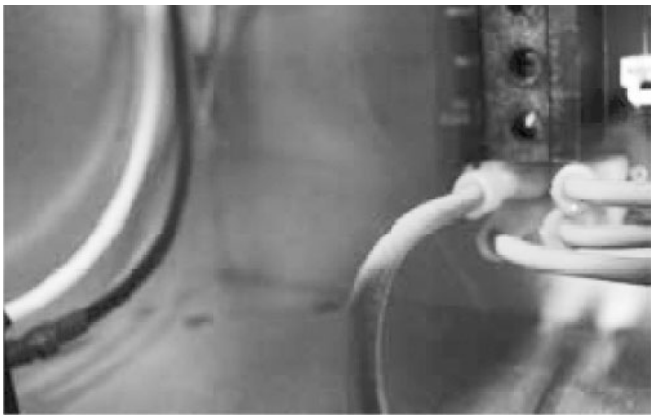
5. Feed Green Ground Wire into Boiler through the wire access:



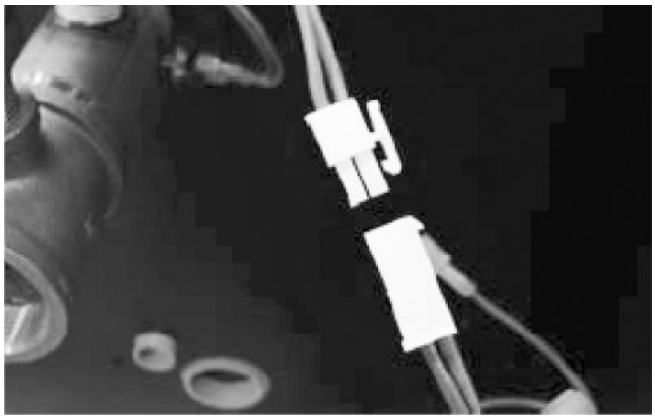
6. From the front of the boiler, feed the ground wire Up into the control box:



7. Once into the control box, attached the green ground to the ground bus connection available:



8. Connect wire harness to the red wire connection on the flow switch:



9. Now that the installation is complete, power up the boiler and use the control to access the Installer Parameter #20 and change the default value to 2 (See Mod Con Installation Manual Part 11 – Program Navigation). When done, create a demand and observe the boiler's function to verfiy the installation is working proeprly.

Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

PART 5: BOILER PIPING (CONTINUED)

F. SCALDING

This water heater can deliver scalding temperature water at any faucet in the system. Be careful whenever using hot water to avoid scalding injury. Certain appliances such as dishwashers and automatic clothes washers may require increased temperature water. By setting the thermostat on this water heater to obatin the increased temperature water required by these appliances, you may create the potential for scald injury. To protect against injury, you should install a mixing valve in the water system. This valve will reduce point of discharge temperature by mixing cold and hot water in branch supply lines. Such valves are available from the local plumbing supplier.

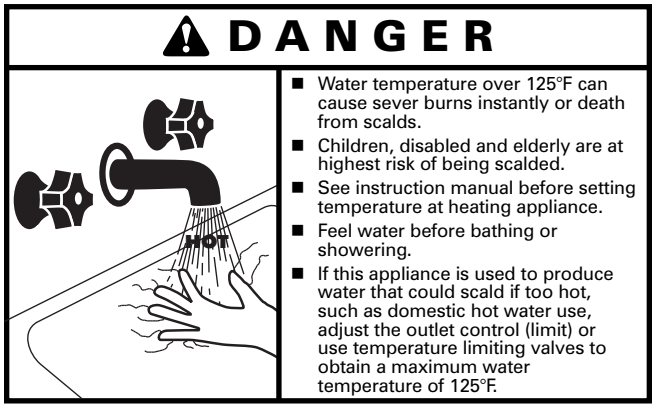

DANGER
HOT
Water temperature over 125°F can cause sever burns instantly or death from scalds.
Children, disabled and elderly are at highest risk of being scalded.
See instruction manual before setting temperature at heating appliance.
Feel water before bathing or showering.
If this appliance is used to produce water that could scald if too hot, such as domestic hot water use, adjust the outlet control (limit) or use temperature limiting valves to obtain a maximum water temperature of 125°F.

Figure 5-3 Scald Warning Label Located on the Appliance

The following chart details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 seconds
155°F	About 1 second

PART 5: BOILER PIPING (CONTINUED)

Fig. 5-1 below represents the combined flow rates and pipe sizes when using multiple boilers to design the manifold system for the primary circuit. To size, simply add up the number of boilers and the required flow rates for the system design temperature.

Example: (5) Mod Con 300 Boilers with a design of 30 degree temperature rise with each boiler having an individual flow rate of 20 GPM. To correctly size the manifold feeding these (5) Mod Con 300 Boilers you would need a pipe size of 3″.

MULTIPLE BOILER MANIFOLD PIPING																							
Flow rate	30	50	60	85	90	100	120	150	170	180	200	210	240	250	255	300	340	350	400	425	510	595	680
Pipe Dia.	2″	2½″	2½″	3″	3″	3″	4″	4″	4″	4″	4″	4″	5″	5″	5″	5″	5″	5″	5″	5″	6″	6″	6″

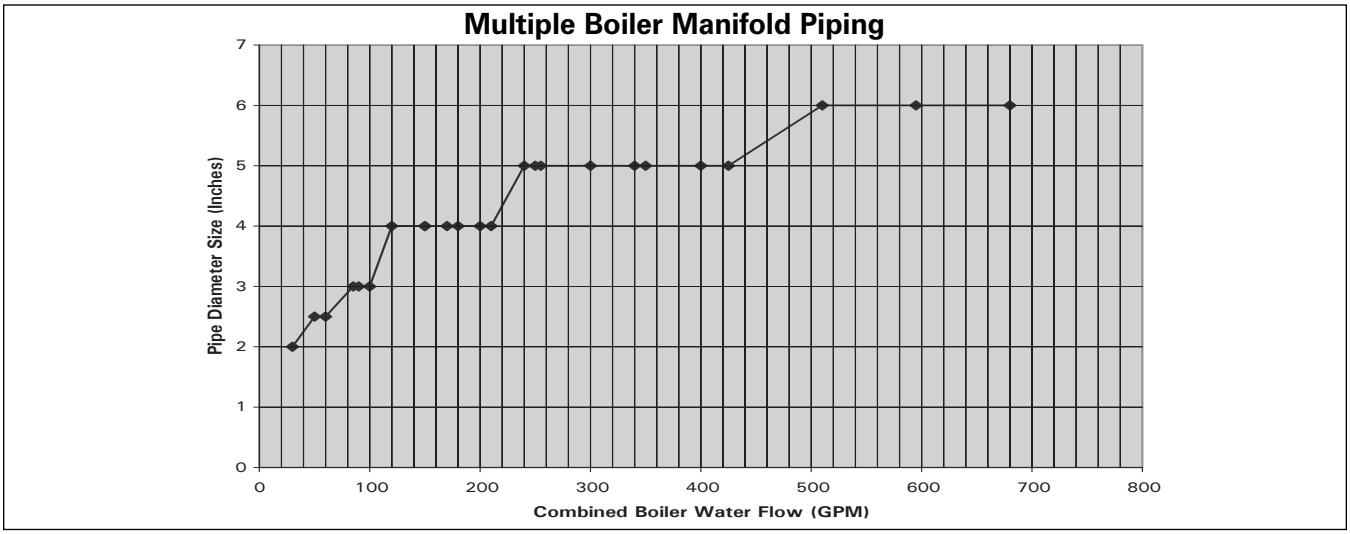


Figure 5-1

The chart below represents the various system design temperature rise through the Mod Con along with their respective flows and friction loss which will aid in circulator selection.

SYSTEM TEMPERATURE RISE CHART				
	20°Δt		25°Δt	
Model	Friction Feet	Flow G P M	Friction Feet	Flow G P M
Mod Con 300 VWH	19′	30	12′	24
Mod Con 500 VWH	19′	50	11′	40
Mod Con 850 VWH	35′	85	26′	65

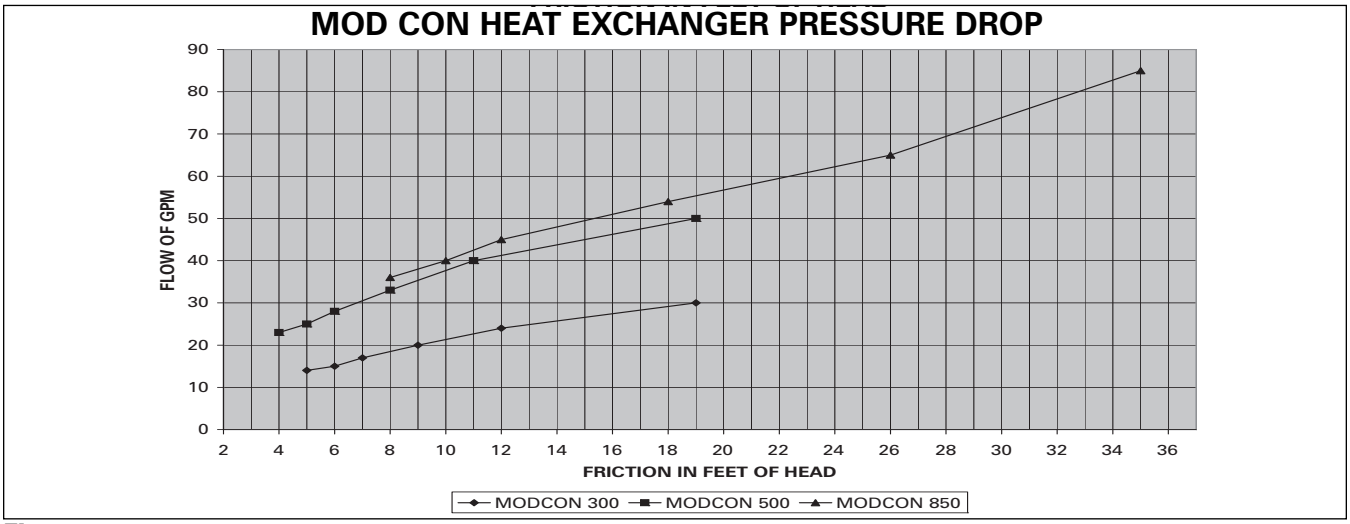


Figure 5-2

PART 5: BOILER PIPING (CONTINUED)

G. HIGH VELOCITY CIRCULATOR PUMP

Every VWH system requires special attention to the pump size in order to overcome the pressure drop through the boiler and its related piping. All circulators installed on the VWH system must be designed for a potable water system.

NOTICE

Water temperature above 140° requires the circulator pump to run continuously and must have a water hardness of between 5 to 7 grains. Hardness above 7 grains will damage the heat exchanger and shorten the service life of the boiler.

Water chemistry*

Water pH between 6.0 and 8.0

1. Maintain boiler water pH between 6.0 and 8.0. Check with litmus paper or have it chemically analyzed by water treatment company.
2. If the pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains.

1. Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chlorine concentration less than 200 ppm

1. Using chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.
2. Do not connect the boiler to directly heat swimming pool or spa water.
3. Do not fill boiler or operate with water containing chlorine in excess of 200 ppm.

***NOTE: It is recommended you clean heat exchanger at least once a year to prevent lime scale buildup. Follow the maintenance procedure to clean the heat exchanger in the Maintenance Section (Part 13 of this manual).**

Piping components

Water heating system piping:

Water heater system piping MUST be sized per tech pipe requirements listed in Fig. 5-1 / 5-2. Reducing the pipe size can restrict flow rate through the water heater, causing inadvertent short cycling and poor system performance.

Check valves:

Field supplied. Check valves are recommended for installation as shown in Piping Details.

Water heater isolation valves:

Field supplied. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the water heater.

Anti-scald mixing valve:

Field supplied. An anti-scald mixing valve is recommended when storing domestic hot water above 115°F.

Unions:

Field supplied: Recommended for unit serviceability. **DO NOT USE DIELECTRIC UNIONS! ONLY BRASS OR STAINLESS STEEL.**

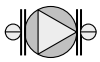
Pressure relief valve:

Factory supplied on Mod Con VWH. The pressure relief valve is sized to ASME specifications. Storage tank may require additional relief valves depending on local codes.

PART 5: BOILER PIPING (CONTINUED)

H. BOILER PIPING DETAILS

Piping Symbol Legend


circulator (open loop)
(w/ isolation flanges)

flow switch

gate valve

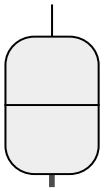
globe valve

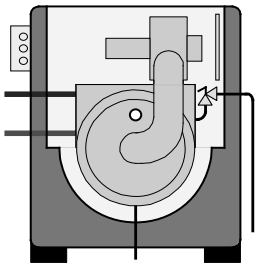
ball valve

swing-check valve

spring-loaded check valve

hose bib / boiler drain


diaphragm-type
expansion tank
(for potable water)


Mod Con Boiler

anti-scald rated
mixing valve

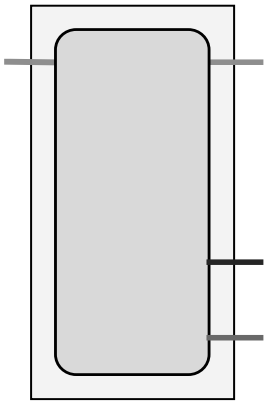
pressure gauge

pressure relief valve
(or P&T relief valve)

temperature /
pressure gauge

union

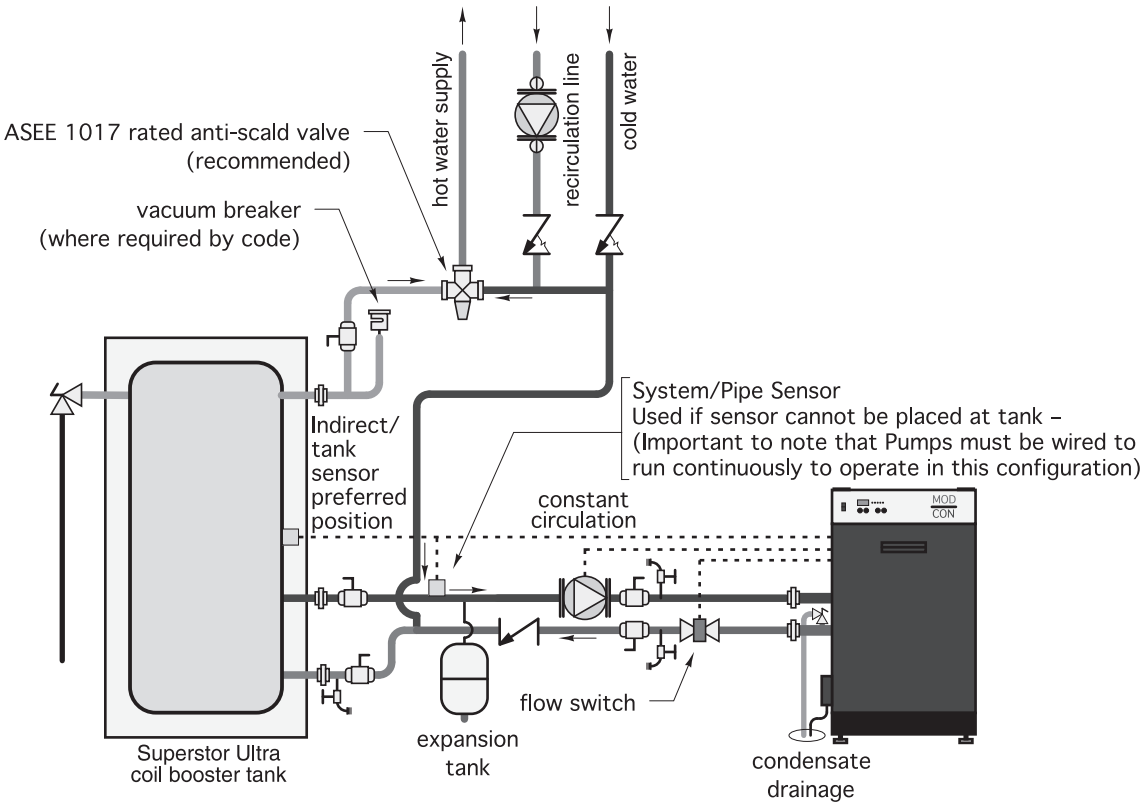
vacuum breaker


Superstor Ultra
Storage Tank

PART 5: BOILER PIPING (CONTINUED)

Volume Water Heating using MOD CON boiler (1 boiler supplying 1 storage tank)

Drawing VWH 1/1 MC


hot water supply
recirculation line
cold water
ASEE 1017 rated anti-scald valve (recommended)
vacuum breaker (where required by code)
System/Pipe Sensor
Used if sensor cannot be placed at tank –
(Important to note that Pumps must be wired to run continuously to operate in this configuration)
Indirect/ tank sensor preferred position
constant circulation
flow switch
expansion tank
Superstor Ultra coil booster tank
condensate drainage
MOD CON

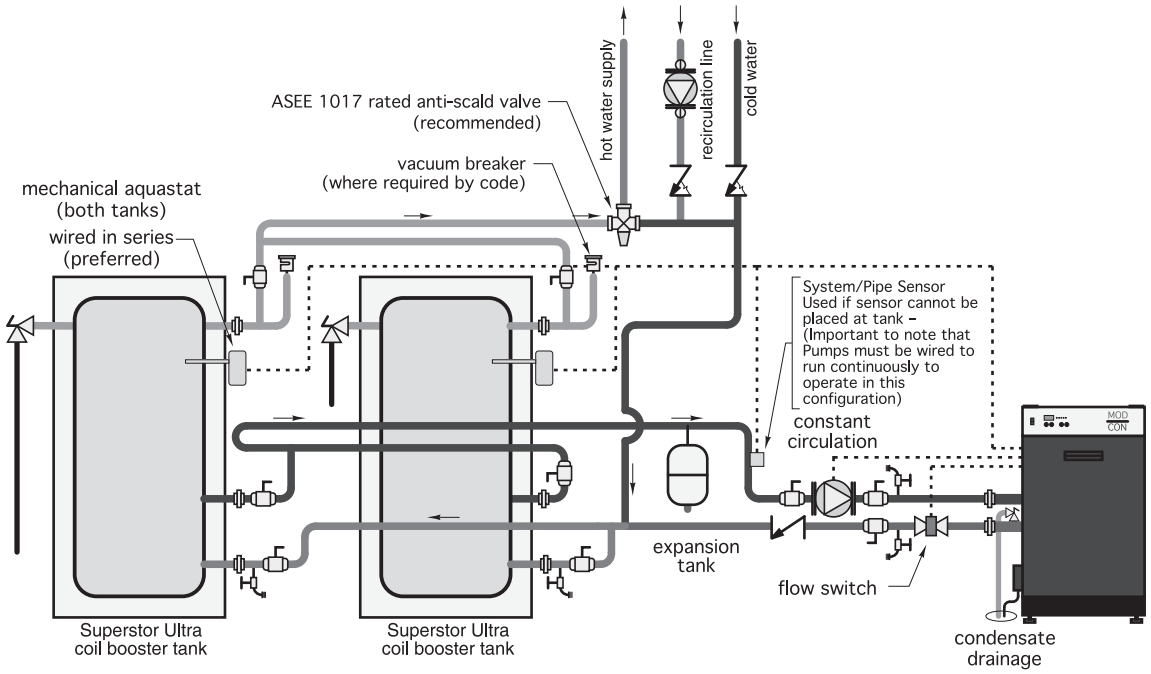
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.5 inch.
5. The minimum pipe size for connecting a MOD CON boiler is 1.5 inches for MOD CON 300 VWH, and 2-inches for MOD CON 500 & 800
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water
12. Use either indirect/tank sensor or system/pipe sensor mounted on common return to boiler.
13. Aquastat or system/pipe sensor connects to DHW sensor input on boiler.

PART 5: BOILER PIPING (CONTINUED)

Volume Water Heating using MOD CON boiler (1 boiler supplying 2 storage tanks)

Drawing VWH 1/2 MC


hot water supply
recirculation line
cold water
ASEE 1017 rated anti-scald valve (recommended)
vacuum breaker (where required by code)
mechanical aquastat (both tanks) wired in series (preferred)
System/Pipe Sensor Used if sensor cannot be placed at tank – (Important to note that Pumps must be wired to run continuously to operate in this configuration)
constant circulation
expansion tank
flow switch
condensate drainage
Superstor Ultra coil booster tank
Superstor Ultra coil booster tank

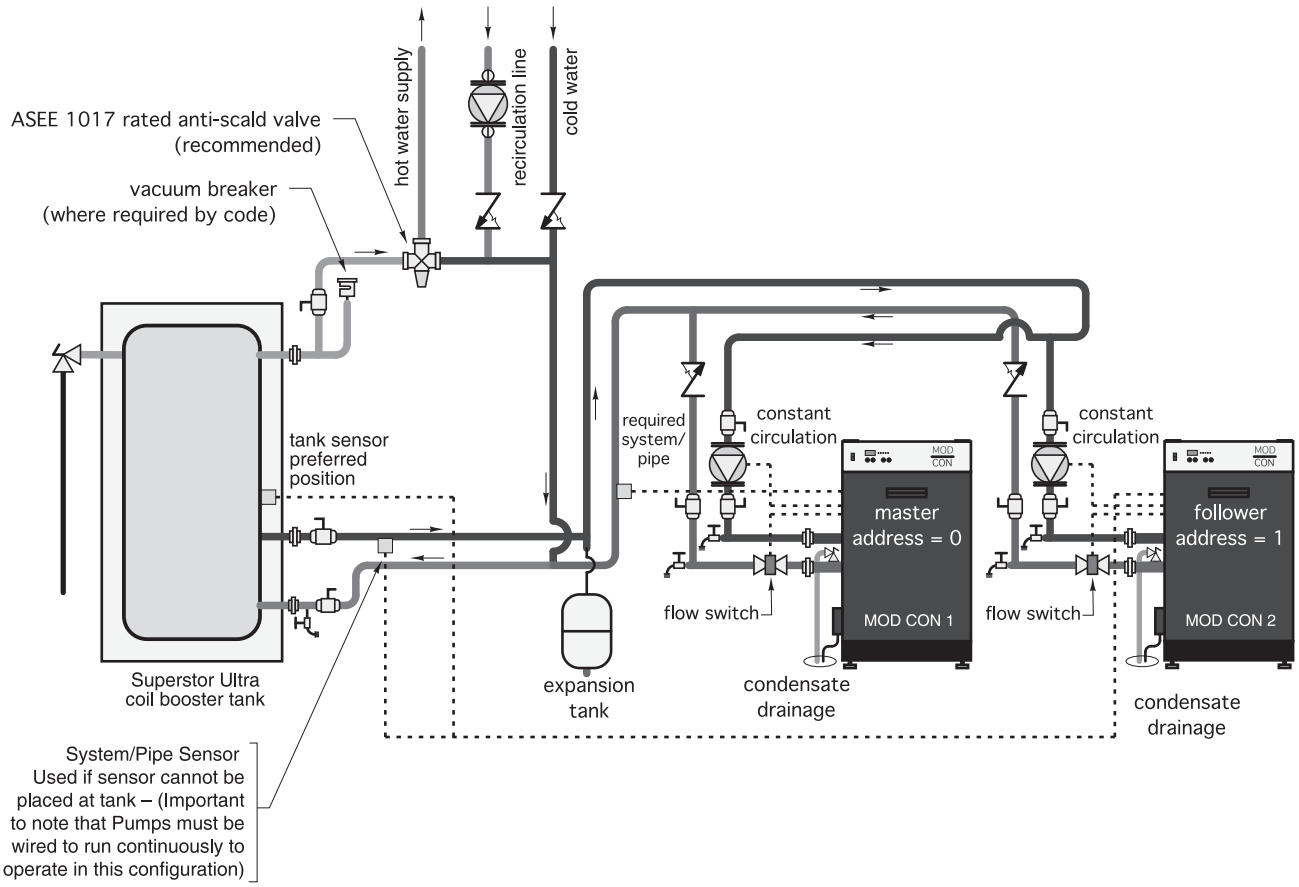
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators.
3. Boiler circulator(s) operate continuously if system/pipe sensor is used.
4. The minimum pipe size for connecting to a water storage tank is 1.5 inch.
5. The minimum pipe size for connecting a MOD CON boiler is 1.5 inches for MOD CON 300 VWH, and 2-inches for MOD CON 500 & 800
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges. with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements.
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown.
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water.
12. Use either a mechanical aquastat in each tank wired in series or system/pipe sensor shown. (Do not use both.)
13. Aquastat or system/pipe sensor connects to DHW sensor input on boiler.

PART 5: BOILER PIPING (CONTINUED)

Volume Water Heating using MOD CON boiler (2 boilers supplying 1 storage tank)

Drawing VWH 2/1H MC


ASEE 1017 rated anti-scald valve (recommended)
vacuum breaker (where required by code)
hot water supply
recirculation line
cold water
tank sensor preferred position
Superstor Ultra coil booster tank
System/Pipe Sensor Used if sensor cannot be placed at tank – (Important to note that Pumps must be wired to run continuously to operate in this configuration)
expansion tank
required system/ pipe
constant circulation
flow switch
master address = 0
MOD CON 1
condensate drainage
constant circulation
flow switch
follower address = 1
MOD CON 2
condensate drainage

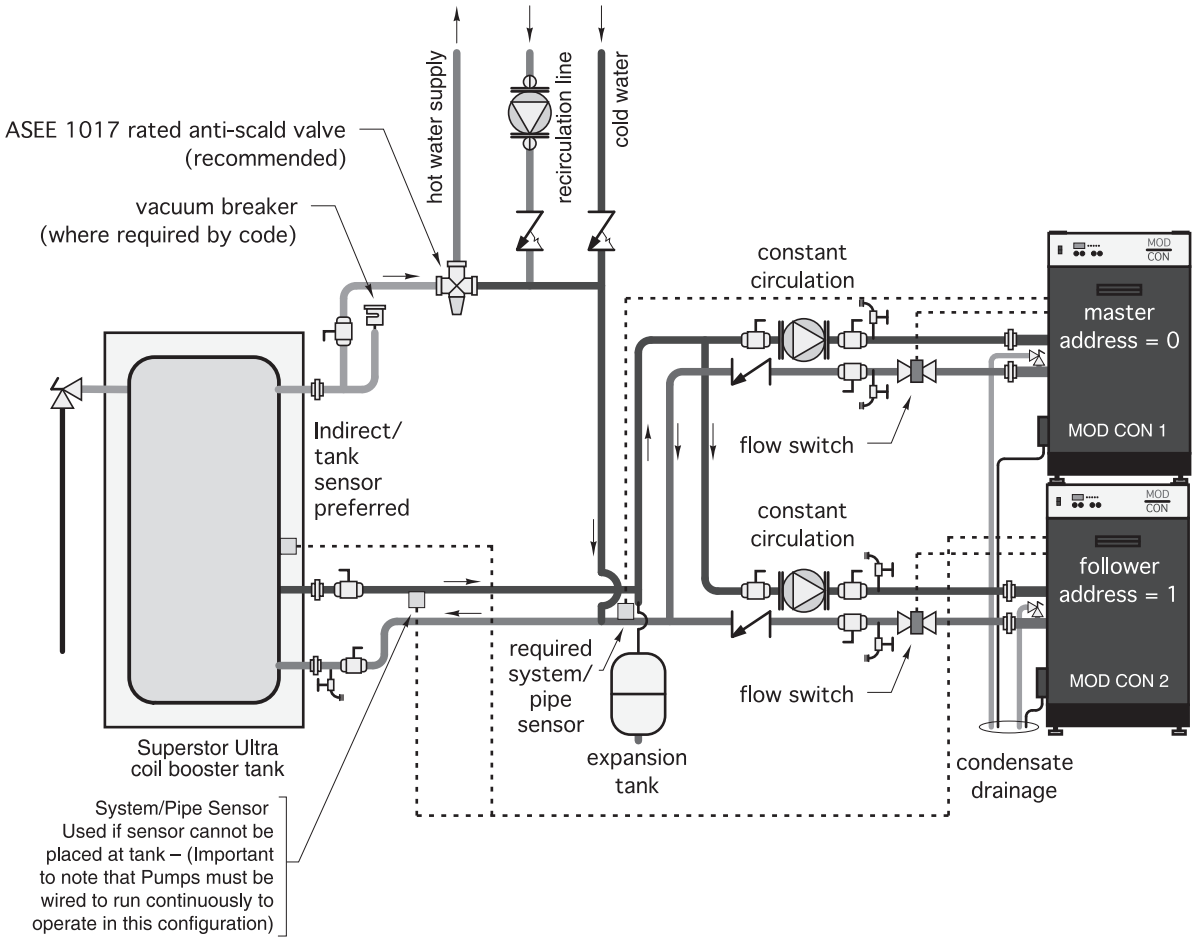
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.5 inch.
5. The minimum pipe size for connecting a MOD CON boiler is 1.5 inches for MOD CON 300 VWH, and 2-inches for MOD CON 500 & 800
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water
12. Use either indirect/tank sensor or system pipe sensor mounted on common return to boiler.
13. Wire the selected tank or system/pipe sensor connected to the DWH sensor terminals on the follower boiler addressed as #1.
14. The system/pipe sensor must be placed on common piping to the tank, as close to tank as possible.
15. The system/pipe sensor is wired to the system sensor terminals on the master boiler.

PART 5: BOILER PIPING (CONTINUED)

Volume Water Heating using MOD CON boiler (2 boilers supplying 1 storage tank)

Drawing VWH 2/1V MC


ASEE 1017 rated anti-scald valve (recommended)
vacuum breaker (where required by code)
hot water supply
recirculation line
cold water
constant circulation
master address = 0
MOD CON 1
flow switch
Indirect/ tank sensor preferred
constant circulation
follower address = 1
MOD CON 2
flow switch
required system/ pipe sensor
expansion tank
condensate drainage
Superstor Ultra coil booster tank
System/Pipe Sensor Used if sensor cannot be placed at tank – (Important to note that Pumps must be wired to run continuously to operate in this configuration)

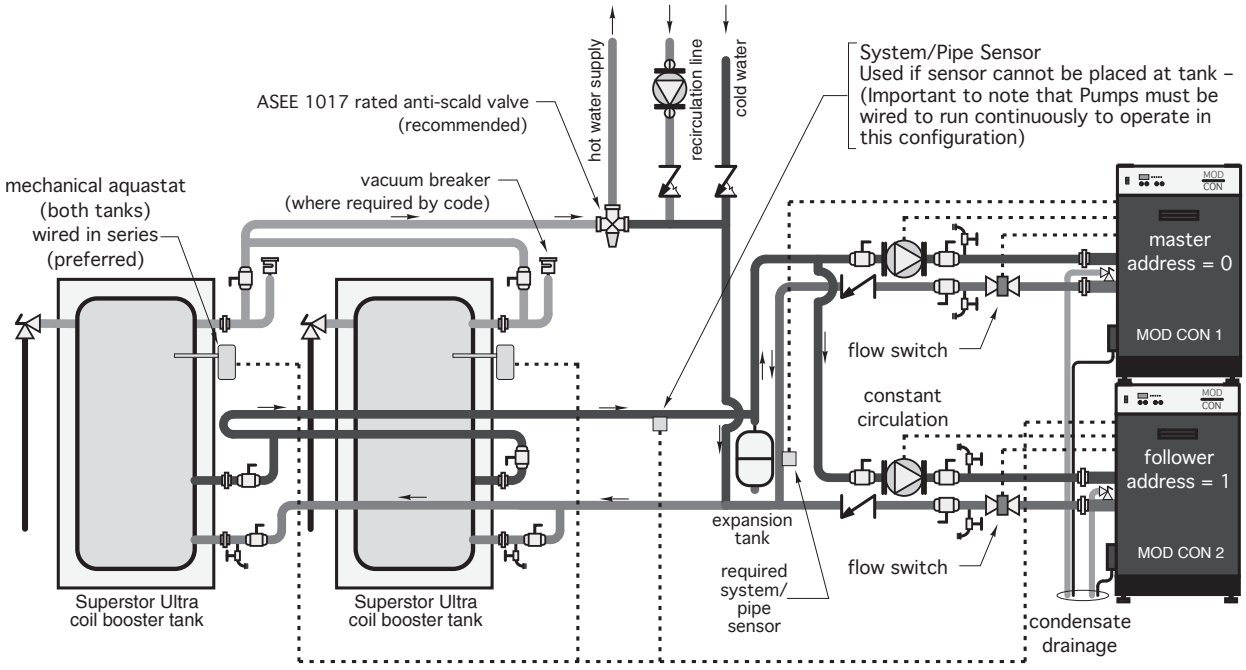
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.5 inch.
5. The minimum pipe size for connecting a MOD CON boiler is 1.5 inches for MOD CON 300 VWH, and 2-inches for MOD CON 500 & 800
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water.
12. Use either indirect/tank sensor or system pipe sensor mounted on common return to boiler.
13. Wire the selected indirect/tank sensor or system pipe sensor connected to the DWH sensor terminals on the follower boiler addressed as #1.
14. The system/pipe sensor must be placed on common piping to the tank, as close to tank as possible.
15. The system/pipe sensor is wired to the system/pipe sensor terminals on the master boiler.

PART 5: BOILER PIPING (CONTINUED)

Volume Water Heating using MOD CON boilers (2 boilers supplying 2 storage tanks)

Drawing VWH 2/2 V MC


hot water supply
recirculation line
cold water
ASEE 1017 rated anti-scald valve (recommended)
System/Pipe Sensor
Used if sensor cannot be placed at tank – (Important to note that Pumps must be wired to run continuously to operate in this configuration)
mechanical aquastat (both tanks) wired in series (preferred)
vacuum breaker (where required by code)
master address = 0
MOD CON 1
flow switch
constant circulation
follower address = 1
MOD CON 2
expansion tank
required system/ pipe sensor
flow switch
Superstor Ultra coil booster tank
Superstor Ultra coil booster tank
condensate drainage

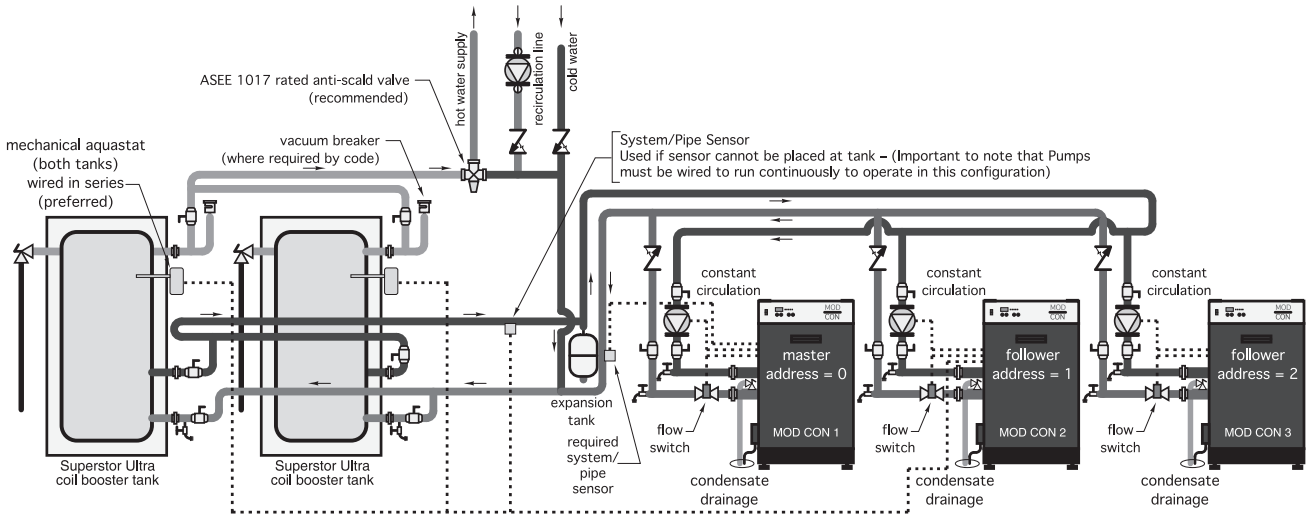
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.5 inch.
5. The minimum pipe size for connecting a MOD CON boiler is 1.5 inches for MOD CON 300 VWH, and 2-inches for MOD CON 500 & 800
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water
12. Use either a mechanical aquastat in each tank wired in series or system/pipe sensor shown. (Do not use both.)
13. Tank aquastats or pipe sensor connected to DHW sensor terminals on boiler addressed as #1.
14. The system/pipe sensor must be placed on common piping to the tank, as close to tank as possible.
15. The system/pipe sensor is wired to the system/pipe sensor terminals on the master boiler.

PART 5: BOILER PIPING (CONTINUED)

Volume Water Heating using MOD CON boiler (3 boilers supplying 2 storage tanks)

Drawing VWH 3/2 H MC


hot water supply
recirculation line
cold water
ASEE 1017 rated anti-scald valve (recommended)
vacuum breaker (where required by code)
mechanical aquastat (both tanks) wired in series (preferred)
System/Pipe Sensor
Used if sensor cannot be placed at tank – (Important to note that Pumps must be wired to run continuously to operate in this configuration)
constant circulation
master address = 0
MOD CON 1
follower address = 1
MOD CON 2
follower address = 2
MOD CON 3
flow switch
condensate drainage
expansion tank
required system/ pipe sensor
Superstor Ultra coil booster tank
Superstor Ultra coil booster tank

NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.5 inch.
5. The minimum pipe size for connecting a MOD CON boiler is 1.5 inches for MOD CON 300 VWH, and 2-inches for MOD CON 500 & 800
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water
12. Use either a mechanical aquastat in each tank wired in series or system/pipe sensor shown. (Do not use both.)
13. Tank aquastats or system pipe sensor connected to DHW sensor terminals on boiler addressed as #1.
14. The system/pipe sensor must be placed on common piping to the tank, as close to tank as possible.
15. The system/pipe sensor is wired to the system/pipe sensor terminals on the master boiler.

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL

A. INSTALLING EXHAUST VENT AND INTAKE AIR VENT

⚠ DANGER

The Mod Con Boiler must be vented as detailed in this section. Ensure the exhaust and intake piping comply with these instructions regarding the venting system.

Inspect finished combustion air intake and exhaust piping thoroughly to ensure all joints are secure and airtight and comply with all applicable code requirements, as well as with the instructions provided in this manual.

Failure to provide a properly installed vent system will cause severe personal injury or death.

⚠ WARNING

This vent system will operate with a positive pressure in the pipe. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure.

Follow these venting instructions carefully. Failure to do so may result in severe personal injury, death, or substantial property damage.

B. GENERAL

1. Install the boiler venting system in accordance with these instructions and with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, CAN/CGA B149, and/or applicable provisions of local building codes.
2. This boiler is a direct vent appliance and is listed as a Category IV appliance with Underwriters Laboratories, Inc.

C. APPROVED MATERIALS FOR EXHAUST VENT AND INTAKE AIR VENT

1. Use only Non Foam Core venting material or AL294C. The following materials are approved for use as vent pipe for this boiler. See Tables 6-1 through 6-7 for all approved venting.

⚠ WARNING

Use only the materials listed in Tables 6-1 through 6-7 for the venting systems. Failure to do so could result in severe personal injury, death or substantial property damage.

REQUIREMENTS FOR INSTALLATION IN CANADA

1. Installations must be made with a vent pipe system certified to ULC-S636. IPEX is an approved vent manufacturer in Canada in Canada supplying vent material listed to ULC-S636. Additionally you may use AL244C stainless steel venting to comply with Canadian requirements.
2. The first three (3) feet of vent pipe from the appliance flue outlet must be readily accessible for visual inspection.
3. The components of the certified vent system must not be interchanged with other vent systems or unlisted pipe / fittings.

⚠ WARNING

Do not use Cellular Foam Core Pipe in any portion of the exhaust piping from this boiler. Use of Foam Core Pipe may result in severe personal injury, death, or substantial property damage.

Cellular foam core piping may be used on air inlet piping **only**.

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

Table 6-1

APPROVED PLASTIC EXHAUST VENTING MATERIAL		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
	UNITED STATES	**CANADA**
PVC SCHEDULE 40 / 80	ANSI /ASTM D1785	ULC S636**
PVC -DWV	ANSI /ASTM D2665	ULC-S636**
CPVC SCHEDULE 40 / 80	ANSI /ASTM F441	ULC- S636**
*Note: Cellular Foam Core Pipe must only be used on INTAKE piping.		**Note: IPEX is an approved Manufacturer in Canada supplying vent material listed to ULC-S636

Table 6-2

APPROVED PLASTIC INTAKE VENTING MATERIAL		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
	UNITED STATES	**CANADA**
PVC SCHEDULE 40 / 80	ANSI /ASTM D1785	ULC S636**
CPVC SCHEDULE 40 / 80	ANSI /ASTM F441	ULC- S636**
PVC DWV	ANSI /ASTM D2665	N/A
PVC-CELLULAR FOAM CORE*	U.L. LISTED	N/A
*Note: Cellular Foam Core Pipe must only be used on INTAKE piping.		**Note: IPEX is an approved Manufacturer in Canada supplying vent material listed to ULC-S636

Table 6-3

APPROVED PLASTIC CONDENSATE PIPING MATERIAL		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
	UNITED STATES	**CANADA**
PVC SCHEDULE 40 / 80	ANSI /ASTM D1785	ULC S636**
		**Note: IPEX is an approved Manufacturer in Canada supplying vent material listed to ULC-S636

Table 6-4

APPROVED PIPE CEMENT AND PRIMER FOR PLASTIC PIPE		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
CEMENT AND PRIMER	**UNITED STATES**	**CANADA**
CPVC	ANSI/ASTM F493	IPEX System 636 Cements and Primers
PVC	ANSI/ASTM D2564	

Table 6-5

APPROVED METALLIC EXHAUST VENTING MATERIAL		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
	UNITED STATES	**CANADA**
AL294C	U.L.LISTED	U.L.LISTED

Table 6-6

APPROVED METALLIC INTAKE VENTING MATERIAL		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
	UNITED STATES	**CANADA**
"B" GAS VENT	U.L. LISTED	U.L. LISTED
GALVANIZED	U.L. LISTED	U.L. LISTED

Table 6-7

APPROVED STAINLESS STEEL VENT ADAPTERS AND TERMINATIONS		
Mod Con 300 & 500	**HTP PART NUMBER**	**Z-FLEX PART NUMBER**
Boiler Adapter 4"	7250P-732	2SVSMK04
Horizontal Vent Terminal 4"	7350P-607	2SVSRTF04
Vertical Rain Cap 4"	7350P-609	2SVSRCF04
Mod Con 850	**HTP PART NUMBER**	**Z-FLEX PART NUMBER**
Boiler Adapter 6"	7350P-114	2SVEP06.5
Horizontal Vent Terminal 6"	7350P-608	2SVSRTX06
Vertical Rain Cap 6"	7350P-610	2SVSRCF06

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

⚠ WARNING

You must not use "B" Vent in an exhaust application. 'B' vent is for intake applications only. Failure to do so will result in serious injury or death.

⚠ WARNING

Both exhaust and intake air vents must exit from the same side of the building to assure correct appliance operation.

D. EXHAUST VENT AND INTAKE AIR VENT PIPE LOCATION

⚠ WARNING

You must insert the provided intake and exhaust screen at your vent terminations to prevent blockage caused by birds or debris.

Please refer to chart below for U.L.-approved stainless steel adapters and terminations.

1. Determine exhaust vent location:
   - Total length of vent may not exceed the limits specified in the venting Sizing Section.
   - The vent piping for this boiler is approved for zero clearance to combustible construction.
   - See illustration within this section of clearances for location of exit terminals of direct-vent venting systems.
   - Avoid terminating exhaust vent near shrubs, air conditioners or other objects that will obstruct the exhaust stream.
   - The flue products coming from the exhaust vent will creat a large plume when the boiler is in operation. Avoid venting in areas that will affect neighboring buildings or be considered objectionable.
   - The boiler vent system shall terminate at least 3 feet (0.9 m) above any forced air intake located within 10 ft (3 m). Note: this does not apply to the combustion air intake of a direct-vent appliance.
   - Provide a minimum of 1 foot distance from any door, operable window, or gravity intake into any building.
   - Provide a minimum of 1 foot clearance from the bottom of the exhaust above the expected snow accumulation level. Snow removal may be necessary to maintain clearance.
   - Provide 4 feet horizontal clearance from electrical meters, gas meters, gas regulators, relief equipment, exhaust fans and inlets. In no case shall the exit terminal be above or below the aforementioned equipment unless the 4 foot horizontal distance is maintained.
   - Do not locate the exhaust over public walkways where condensate could drip and/or freeze and create a nuisance or hazard.
   - When adjacent to a public walkway, locate exit terminal at least 7 feet above grade.
   - Do not locate the exhaust directly under roof overhangs to prevent icicles from forming.
   - Provide 6 feet clearance from the inside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.
2. Determine air intake vent location.
   - Provide 1 foot clearance from the bottom of the intake air vent and the level of maximum snow accumulation. Snow removal may be necessary to maintain clearances.
   - Do not locate intake air vent in a parking area where machinery may damage the pipe.
   - Follow required minimum clearances located in Fig. 6-3, 6-4, 6-5.
3. Determine location of Condensate Piping

   This boiler is a high efficiency appliance, therefore the boiler produces condensate. Condensate is a by-product of the boiler combustion process. A condensate collection system with an internal float switch

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

monitors the condensate level to prevent it from backing up into the combustion system. There is a ¾" sweat connection provided to connect the outlet of the collection system to a drain or condensate pump. (See table 6-3 for approved condensate piping material)

CAUTION

It is very important that the condensate piping be no smaller than ¾" and you must use a tee at the condensate connection with the branch vertically up and open to the atmosphere so it will not cause a vacuum that could obstruct the flow of condensate from the boiler. The condensate piping should also be properly supported with pipe supports to prevent sagging and to maintain the pitch of the piping.

4. Condensate Neutralization

   The condensate from the boiler is slightly acidic with a ph of 3.2 - 4.5 Heat Transfer Products recommends neutralizing the condensate with a Condensate Neutralizer Kit (p/n 7350P-611) that can be added to your system to avoid long term damage to the drainage system and to meet local code requirements. The neutralizer kit is connected to the drain system and contains marble chips that will neutralize the ph level of the water vapor. The neutralizer should be checked at least once a year and the marble chips should be replenished if necessary. When replacing the marble chips, they should be no smaller than ½" to avoid blockage in condensate piping. (Refer to Fig. 6-1 and 6-2 for piping of the Condensate neutralizer.)

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

CONDENSATE NEUTRALIZER WITHOUT PUMP

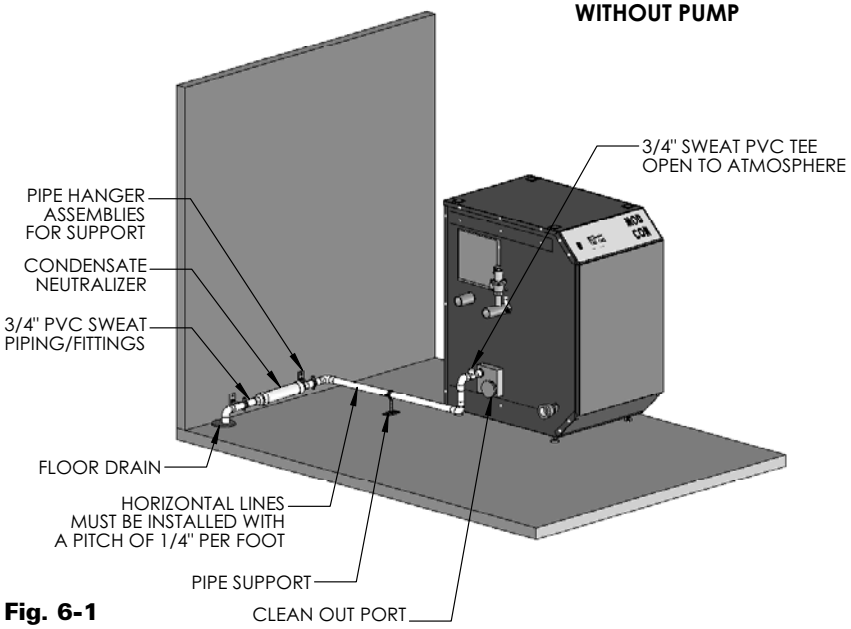
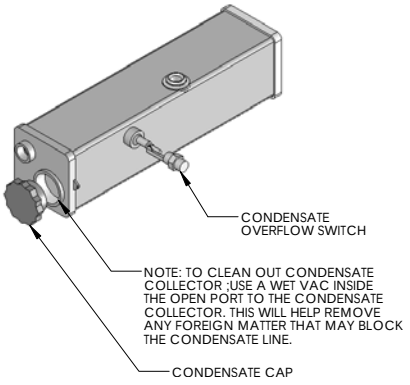

3/4" SWEAT PVC TEE
OPEN TO ATMOSPHERE
PIPE HANGER ASSEMBLIES FOR SUPPORT
CONDENSATE NEUTRALIZER
3/4" PVC SWEAT PIPING/FITTINGS
FLOOR DRAIN
HORIZONTAL LINES MUST BE INSTALLED WITH A PITCH OF 1/4" PER FOOT
PIPE SUPPORT
CLEAN OUT PORT

Fig. 6-1


CONDENSATE OVERFLOW SWITCH
NOTE: TO CLEAN OUT CONDENSATE COLLECTOR ;USE A WET VAC INSIDE THE OPEN PORT TO THE CONDENSATE COLLECTOR. THIS WILL HELP REMOVE ANY FOREIGN MATTER THAT MAY BLOCK THE CONDENSATE LINE.
CONDENSATE CAP

⚠ WARNING

When servicing is complete, you must make sure the cap is replaced securely. Failure to do so will cause venting issue that will result in serious injury or death.

LP-205-ZZ Rev. 2/19/09

CONDENSATE NEUTRALIZER WITH PUMP

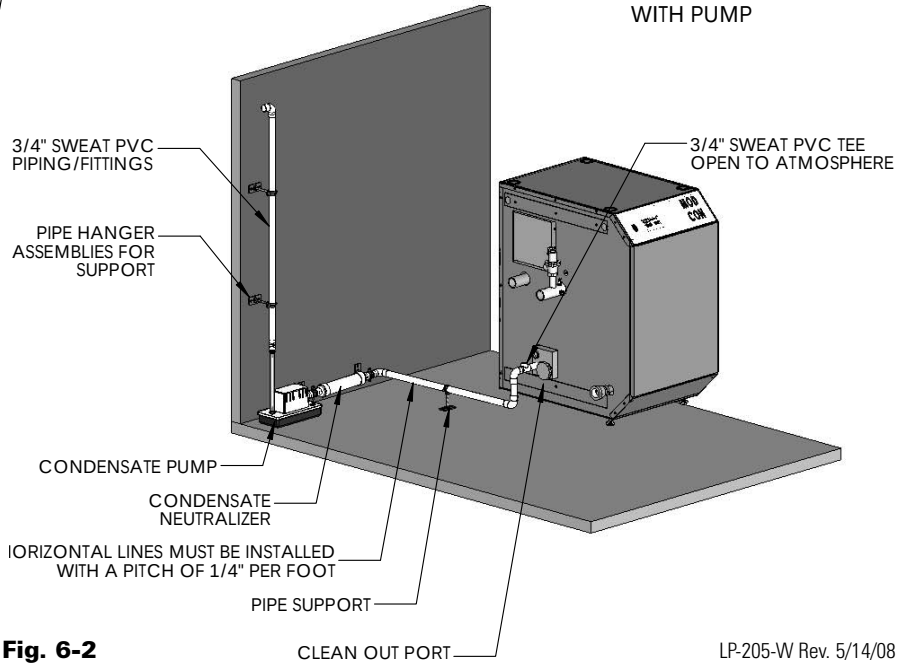

3/4" SWEAT PVC PIPING/FITTINGS
PIPE HANGER ASSEMBLIES FOR SUPPORT
3/4" SWEAT PVC TEE OPEN TO ATMOSPHERE
CONDENSATE PUMP
CONDENSATE NEUTRALIZER
IORIZONTAL LINES MUST BE INSTALLED WITH A PITCH OF 1/4" PER FOOT
PIPE SUPPORT
CLEAN OUT PORT

Fig. 6-2

LP-205-W Rev. 5/14/08

CAUTION

The condensate line must remain unobstructed, allowing free flow of condensate. If condensate is allowed to freeze in the line or if the line is obstructed in any other manor, condensate can exit from the boiler tee, resulting in potential water damage to property.

NOTICE

When installing a condensate pump, select one approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage.

Condensate from the Mod Con Boiler will be slightly acidic (typically with a pH from 3.2 to 4.5). Install a neutralizing filter if required by local codes.

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

Location of exit terminals of mechanical draft and direct-vent venting systems.
(Reference: National Fuel Gas Code ANSI Z223.1/NFPA 54 2002).

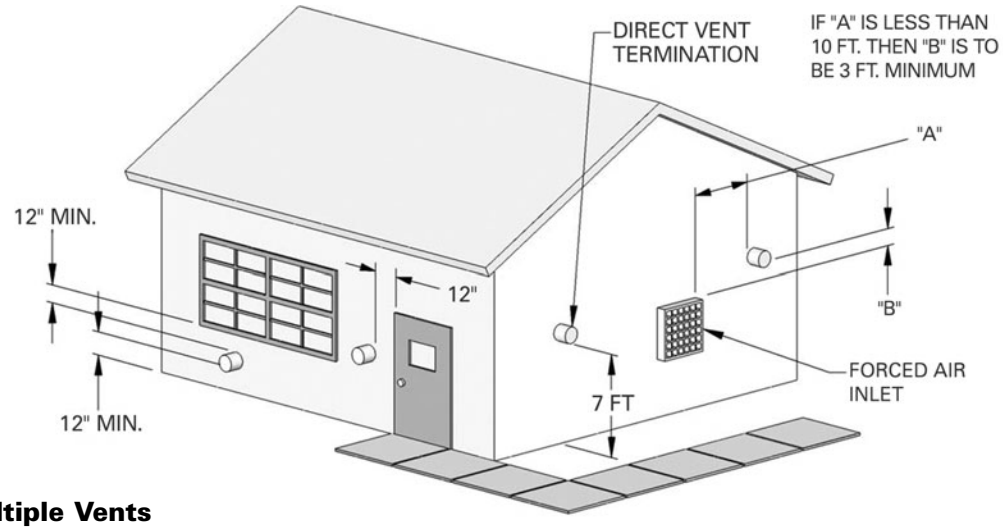


Fig. 6-3 Multiple Vents

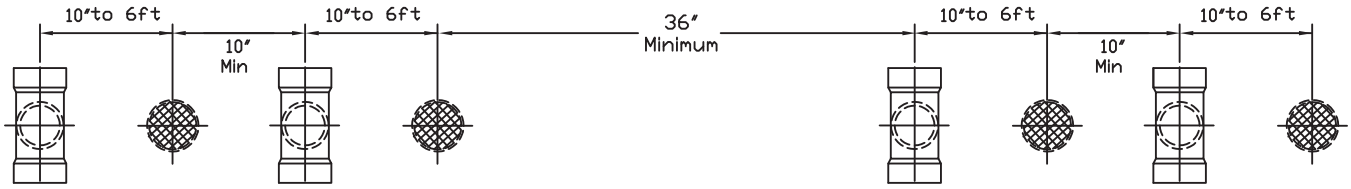


Fig. 6-4 Multiple Vent Spacing*
*Note: Exhaust must extend out 1 foot. There should be no more than 2 vents and 2 intakes then a space of 36" to the next set of vents.
*Note: There must be a minimum of 36" spacing between every 2 kit grouping.

Multiple "V" Series Vents

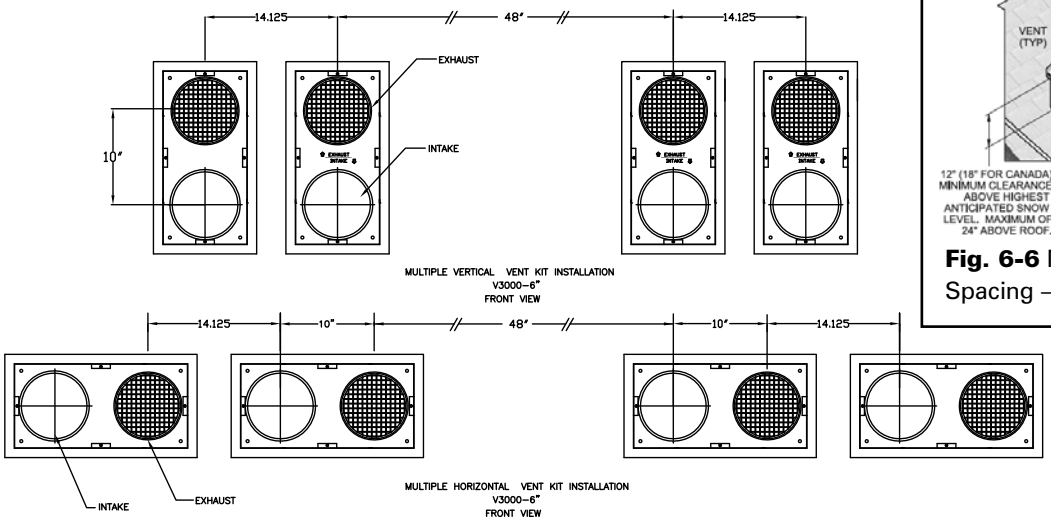


Fig. 6-5 Multiple Stainless Steel Horizontal Vent Kit Installation – Front View

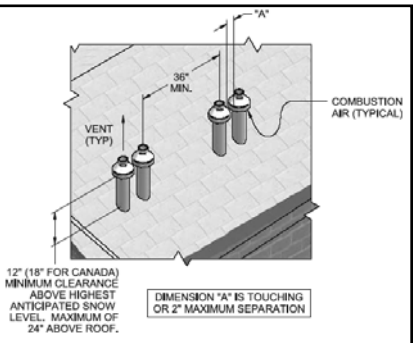

"A"
36" MIN.
COMBUSTION AIR (TYPICAL)
VENT (TYP)
12" (18" FOR CANADA) MINIMUM CLEARANCE ABOVE HIGHEST ANTICIPATED SNOW LEVEL. MAXIMUM OF 24" ABOVE ROOF.
DIMENSION "A" IS TOUCHING OR 2" MAXIMUM SEPARATION

Fig. 6-6 Multiple Concentric Vent Spacing – Vertical

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

E. EXHAUST VENT AND INTAKE AIR VENT SIZING

1. The exhaust vent and intake air vent pipes are 4" for the Mod Con 300 and 500, and 6" for the Mod Con 850.
2. The total combined equivalent length of exhaust vent and intake air pipe should not exceed 200 feet.
   a. The equivalent length of elbows, tees, and other fittings are listed in the Friction Loss Table 6-8.

Table 6-8

Friction Loss Equivalent for Stainless or Plastic Piping and Fittings			
Fitting Description	**4"**	**6"**	**8"**
90° elbow short radius	3'	3'	3'
90° elbow long radius	2'	2'	2'
45° elbow	1'	1'	1'
Coupling	0'	0'	0'
Tee (intake only)	0'	0'	0'
V Series Vent Kit	1'	1'	1'
AL29 4C Vent Terminal	1'	1'	1'
Pipe (All materials)	1′	1′	1′

*Friction loss for long radius elbow is 1 foot less.

   b. For example: If the exhaust vent has two short 90° elbows and 10 feet of PVC pipe we will calculate:

Exhaust Vent Pipe Equivalent Length = (2x3)+10=16 feet

Further, if the intake air vent pipe has two short 90° elbows, one 45° elbow and 10 feet of PVC pipe, the following calculation applies:

Intake Air Vent Pipe Equivalent Length = (2x3)+1+10=17 feet

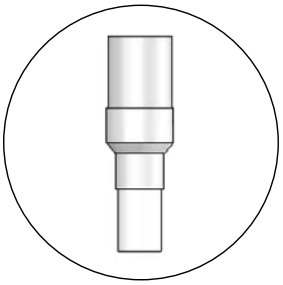
   c. The intake air vent pipe and the exhaust vent are intended to penetrate the same wall or roof of the building.
   d. You should keep an equivalent length between the intake air vent pipe and the exhaust vent. The minimum combined equivalent length is 16 to 32 maximum combined equivalent feet.

F. LONGER VENT RUNS

1. The maximum combined equivalent length can be extended by increasing the diameter of both exhaust vent and intake air vent pipe equally. However, the transitions should begin a minimum of 16 to 32 maximum combined equivalent feet from the boiler on both the intake and exhaust equally.
   a. The maximum equivalent length for the increased diameter vent pipes is 275 feet, which includes the combined 32 feet from the boiler, 16 ft. (inlet) + 16 ft. (exhaust) = 32 ft. combined with transition total of 245 ft. upsize piping for longer vent runs.

Table 6-9

Vent Transition Fitting		
Size	**Reducing Coupling**	**Final Vent Size**
4" venting	6" x 4"	6"
6" venting	8" x 6"	8"



NOTE: EXTENDED VENT RUNS WHEN TRANSITIONING TO A LARGER DIAMETER MUST ALWAYS TAKE PLACE IN A VERTICAL POSITION TO PREVENT CONDENSATE BLOCKAGE.

G. EXHAUST VENT AND INTAKE AIR PIPE INSTALLATION

1. Use only solid PVC, or CPVC schedule 40 or 80 pipe and AL294C Stainless Steel. FOAM CORE PIPING IS ONLY ALLOWED FOR INTAKE PIPING.
2. Remove all burrs and debris from joints and fittings.
3. All joints must be properly cleaned, primed, and cemented. Use only cement and primer approved for use with the pipe material. Refer to the Venting Table 6-4.

⚠ WARNING

All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into the living space.

4. Horizontal lengths of exhaust vent must slope back towards the boiler not less than ¼" per foot to allow condensate to drain from the

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

vent pipe. If the exhaust pipe must be piped around an obstacle that results in the creation of a low point, condensate will collect in this low point and form a blockage. This condensate must be drained away using a field-installed condensate drain assembly. All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of ¼" per foot back to the boiler to allow drainage of condensate. The condensate drain piping should be a minimum of ¾" PVC Rigid Piping, pitched at a minimum of ¼" per foot away from the boiler. (See Fig. 6-1, 6-2)

5. All piping must be fully supported. Use pipe hangers at a minimum of 4 foot intervals to prevent sagging of the pipe where condensate may form. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet of the boiler.
6. Do not use the boiler to support any piping.
7. A screened straight coupling is provided with the boiler for use as an outside exhaust termination.
8. A screened inlet air tee is provided with the boiler to be used as an outside intake termination.

H. HEATER REMOVAL FROM A COMMON VENT SYSTEM

At the time of removal of an existing heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to common venting system are not operating.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion or other deficiencies that could cause an unsafe condition.
3. If practical, close all building doors, windows and all doors between the space in which the appliance remains connected to the common venting system located and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.
6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1

Note: For Canadian Installations, it is required that Non Metallic Vent Installations conform to ULC S636. Where plastic venting is not allowed, HTP recommends AL294C Stainless Steel Venting be used for Exhaust venting installations and "B" vent for intake air.

Please refer to 6-7 for U.L. Approved Stainless Steel Vent Adapters.

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

I. DIAGRAMS FOR SIDEWALL VENTING

TWO PIPE SIDEWALL VENTING W/TEE (INTAKE) AND COUPLING (EXHAUST)

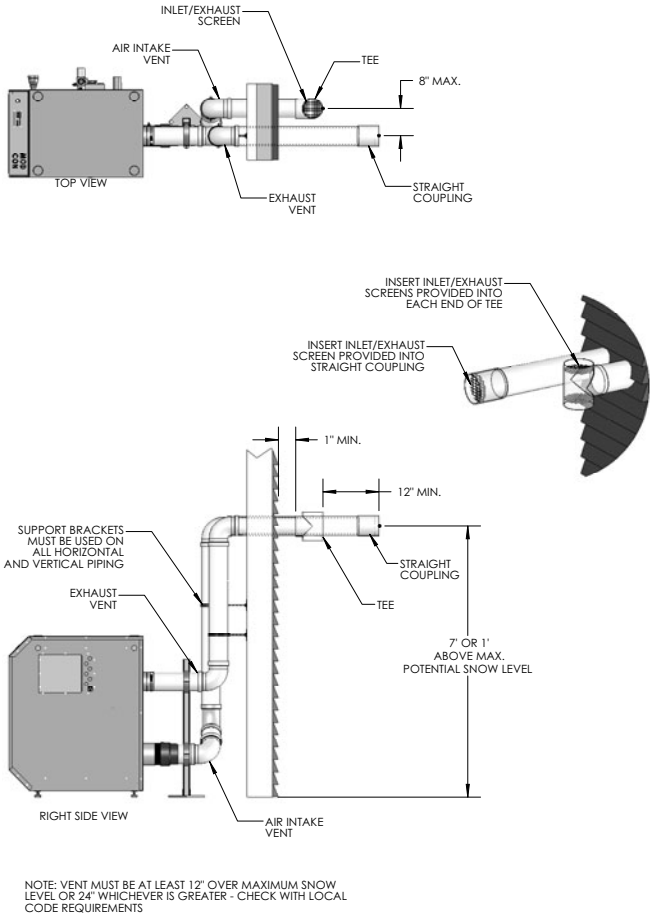
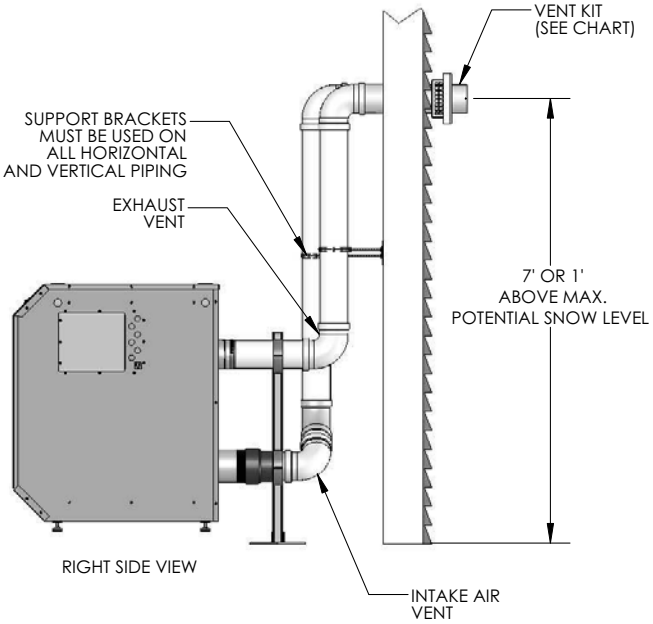
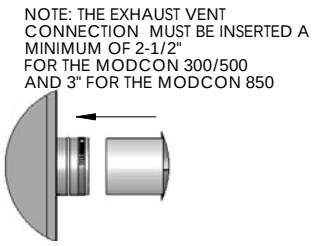

INLET/EXHAUST SCREEN
AIR INTAKE VENT
TEE
8" MAX.
TOP VIEW
EXHAUST VENT
STRAIGHT COUPLING
INSERT INLET/EXHAUST SCREENS PROVIDED INTO EACH END OF TEE
INSERT INLET/EXHAUST SCREEN PROVIDED INTO STRAIGHT COUPLING
1" MIN.
12" MIN.
SUPPORT BRACKETS MUST BE USED ON ALL HORIZONTAL AND VERTICAL PIPING
EXHAUST VENT
STRAIGHT COUPLING
TEE
7' OR 1' ABOVE MAX. POTENTIAL SNOW LEVEL
RIGHT SIDE VIEW
AIR INTAKE VENT
NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS

Figure 6-7 LP-205-E Rev. 6/23/08

TWO PIPE SIDEWALL VENTING WITH V-SERIES KIT


VENT KIT (SEE CHART)
SUPPORT BRACKETS MUST BE USED ON ALL HORIZONTAL AND VERTICAL PIPING
EXHAUST VENT
7' OR 1' ABOVE MAX. POTENTIAL SNOW LEVEL
RIGHT SIDE VIEW
INTAKE AIR VENT
NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS



1. Prep PVC Pipe by removing burrs on the leading edge before inserting into the boiler adapter to prevent damage to internal o-ring seal.

   Do not use any Liquids or Petroleum based products that could damage the o-ring seal - It is recommended you use talcum powder to assist in inserting pipe into adapter.

2. Tighten clamp to a maximum of 50 inch pounds to avoid reforming connected PVC which may cause combustion leaks.

Figure 6-8 LP-205-F Rev. 5/15/08

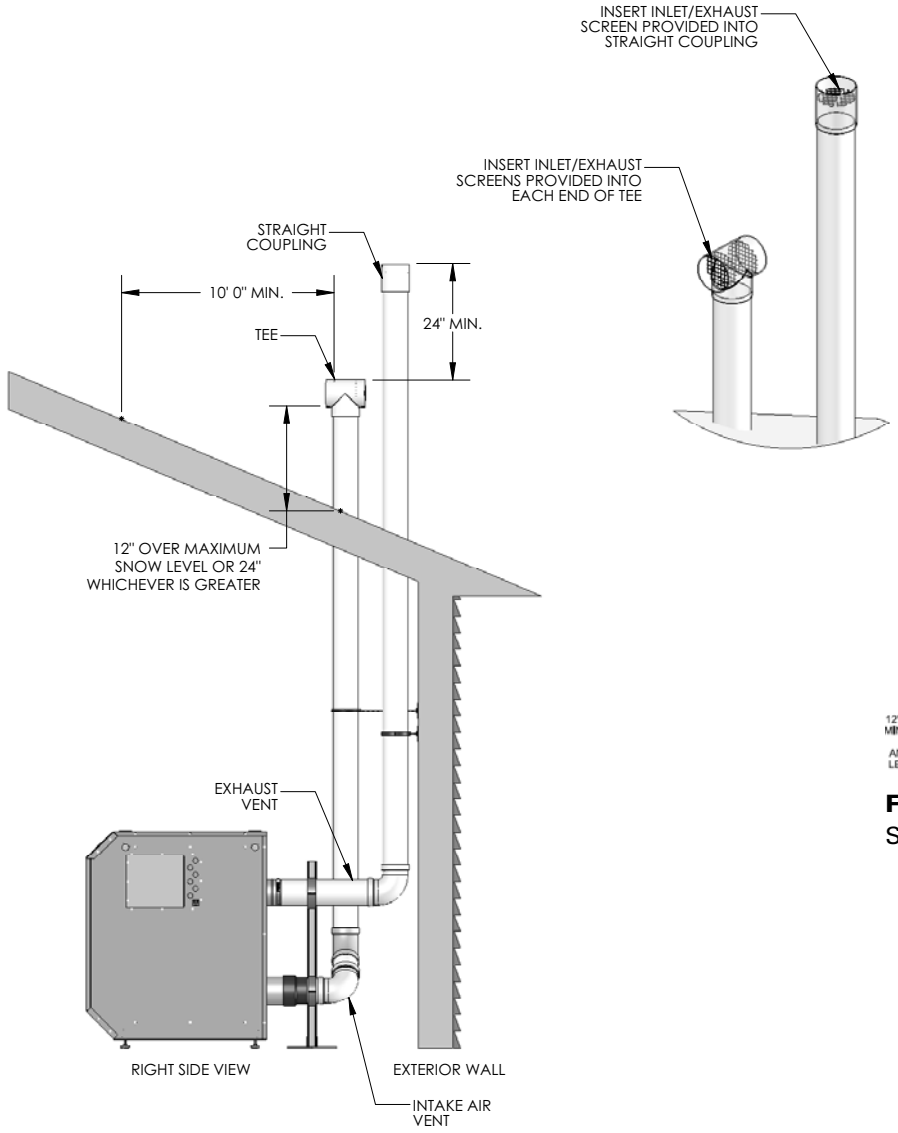
⚠ WARNING

All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate). Exhaust connection insertion depth should be a minimum of 2½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

J. DIAGRAM FOR VERTICAL VENTING

TWO PIPE ROOF VENTING WITH TEE (INTAKE) AND COUPLING (EXHAUST)


INSERT INLET/EXHAUST SCREEN PROVIDED INTO STRAIGHT COUPLING
INSERT INLET/EXHAUST SCREENS PROVIDED INTO EACH END OF TEE
STRAIGHT COUPLING
10' 0" MIN.
24" MIN.
TEE
12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER
EXHAUST VENT
RIGHT SIDE VIEW
EXTERIOR WALL
INTAKE AIR VENT

NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS

Figure 6-9

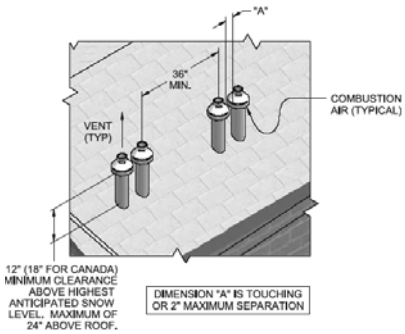

"A"
36" MIN.
COMBUSTION AIR (TYPICAL)
VENT (TYP)
12" (18" FOR CANADA) MINIMUM CLEARANCE ABOVE HIGHEST ANTICIPATED SNOW LEVEL. MAXIMUM OF 24" ABOVE ROOF.
DIMENSION "A" IS TOUCHING OR 2" MAXIMUM SEPARATION

Fig. 6-10 Multiple Concentric Vent Spacing – Vertical

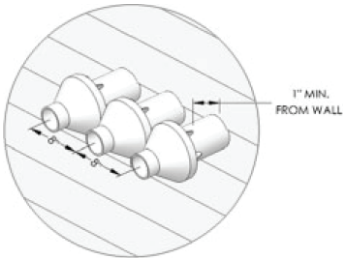


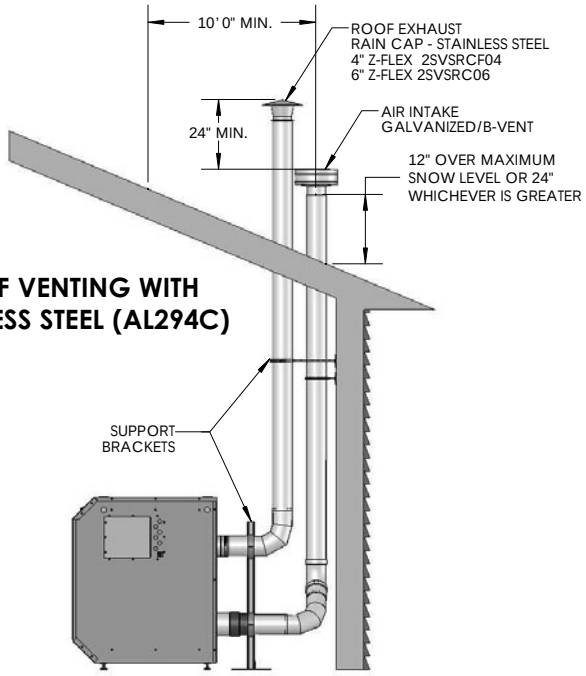
Fig. 6-11 Multiple Concentric Vent Spacing – Horizontal

LP-205-G Rev. 6/23/08

⚠ WARNING

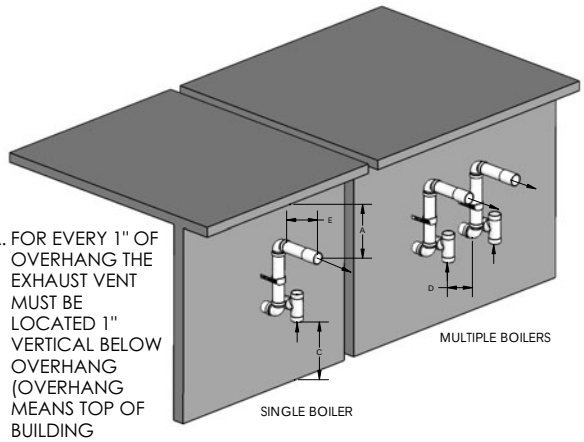
All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate). Exhaust connection insertion depth should be a minimum of 2½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)



ROOF VENTING WITH STAINLESS STEEL (AL294C)

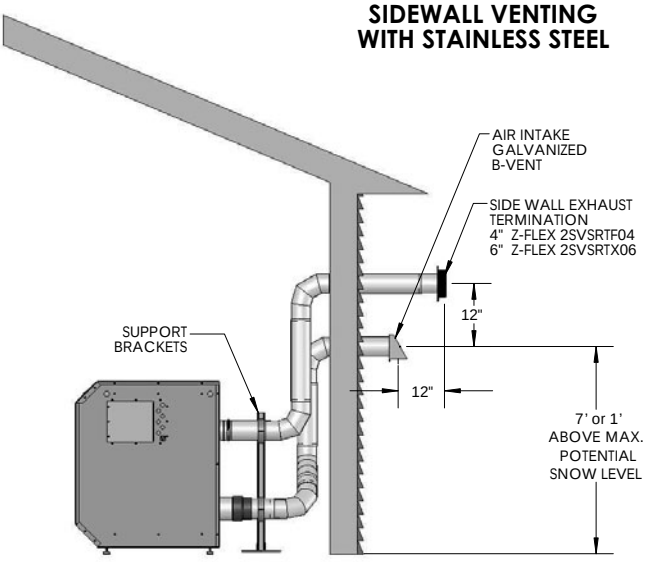
DIAGRAM FOR HORIZONTAL VENTING



A. FOR EVERY 1" OF OVERHANG THE EXHAUST VENT MUST BE LOCATED 1" VERTICAL BELOW OVERHANG (OVERHANG MEANS TOP OF BUILDING STRUCTURE AND NOT TWO ADJACENT WALLS [CORNER OF BUILDING]).
B. 12" SEPARATION BETWEEN BOTTOM OF EXHAUST OUTLET AND TOP OF AIR INTAKE (TYP.)
C. MAINTAIN 12" MINIMUM CLEARANCE ABOVE HIGHEST ANTICIPATED SNOW LEVEL OR GRADE WHICHEVER IS GREATER (TYP.)
D. MINIMUM 12" BETWEEN VENTS WHEN INSTALLING MULTIPLE VENTS
E. 12 " MIN. BEYOND INTAKE

Figure 6-12 VT-A Rev. 8/28/09

SIDEWALL VENTING WITH STAINLESS STEEL



NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS

Figure 6-13 LP-205-Y Rev. 1/30/09

⚠ WARNING

All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate). Exhaust connection insertion depth should be a minimum of 2½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

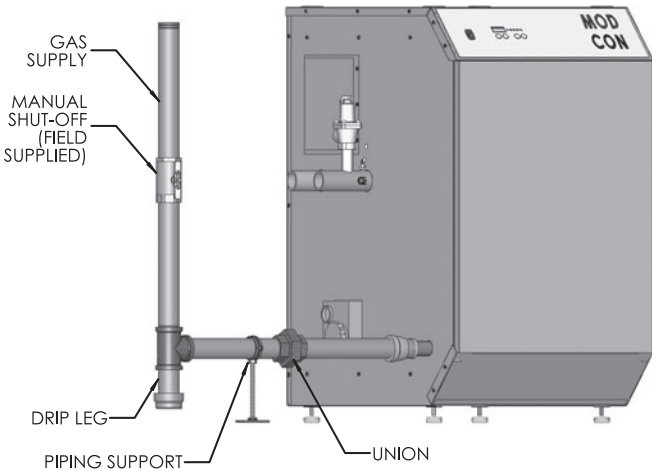
PART 7: GAS PIPING

⚠ WARNING

Failure to follow all precautions in this section could result in fire, explosion or death!

A. GAS CONNECTION

The gas supply shall have a maximum inlet pressure of less than 14" w.c. (3.5 kPa), and a minimum of 3.5" w.c. (.87 kPa). The entire piping system, gas meter and regulator must be sized properly to prevent pressure drop greater than 0.5" (.12 kPa) as stated in the National Fuel Gas Code. This information is listed on the rating label.



⚠ WARNING

It is very important that you are connected to the type of gas as noted on the rating plate. "LP" for liquefied petroleum, propane gas or, "Nat" natural or city gas. You must not do a gas conversion on this boiler. All gas connections must be approved by the local gas supplier, or utility in addition to the governing authority, prior to turning the gas supply on.

The gas connection on the Mod Con is 1-1/4" for the Mod Con 300, 1-1/2" for the Mod Con 500 and 2" for the Mod Con 850. It is mandatory that this fitting is used for connection to a field fabricated drip leg as shown in the illustration above per the National Fuel Gas Code. You must ensure that the entire gas line to the connection at the Mod Con is no smaller than the unit supplied connection. Once all the inspections have been performed, the piping must be leak tested.

If the leak test requirement is a higher test pressure than the maximum inlet pressure, you must isolate the Mod Con from the gas line. In order to do this, you must shut the gas off using factory and field-installed gas cocks. This will prevent high pressure. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" w.c. (3.5 kPa), the gas valve must be replaced. Never use an open flame (match, lighter, etc.) to check gas connections.

B. GAS PIPING

1. Run the gas supply line in accordance with all applicable codes.
2. Locate and install manual shutoff valves in accordance with state and local requirements.
3. In Canada, the Manual Shutoff must be identified by the installing contractor.
4. It is important to support gas piping as the unit is not designed to structurally support large amount of weight.
5. Purge all gas lines thoroughly to avoid start up issues with air in the lines.
6. Sealing compound must be approved for gas connection. Care must be taken when applying compound to prevent blockage or obstruction of gas flow which my effect the operation of the unit.

⚠ WARNING

Never use an open flame (Match or Lighter) to check for Gas leaks. Use A soapy solution to test gas connection for leaks. Failure to use soapy solution test or check gas connection for leaks can cause substantial property damage, severe personal injury or death .

NOTICE

CSA or UL listed Flexible gas connections can be used when installing The Mod Con Boiler. Flexible gas connections have different capacities and must be sized correctly for the connected boiler firing rates. Consult with the flex line supplier to assure the line size is adequately sized for the job. Follow local codes for proper installation and service requirements.

PART 7: GAS PIPING (CONTINUED)

C. GAS TABLE

Refer to Table 7-1 to size the supply piping to minimize pressure drop between meter or regulator and unit.

Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 w.c. or Less and a Pressure Drop of 0.3 Inch w.c.

Table 7-1

NATURAL GAS SUPPLY PIPING CAPACITY CHART								
(0.6 specific gravity gas; 0.5″ WC pressure drop) ***Schedule 40 iron pipe size in nominal inch size**								
Boiler Model	**1 Boiler**	**2 Boilers**	**3 Boilers**	**4 Boilers**	**5 Boilers**	**6 Boilers**	**7 Boilers**	**8 Boilers**
Cubic Ft. Hr.	300	600	900	1200	1500	1800	2100	2400
ModCon 300 VWH @ 100′ of pipe	1 1/4″	1 1/2″	2″	2 1/2″	2 1/2″	2 1/2″	3″	3″
ModCon 300 VWH @ 250′ of pipe	1 1/2″	2″	2 1/2″	3″	3″	3″	4″	4″
Boiler Model	**1 Boiler**	**2 Boilers**	**3 Boilers**	**4 Boilers**	**5 Boilers**	**6 Boilers**	**7 Boilers**	**8 Boilers**
Cubic Ft. Hr.	500	1000	1500	2000	2500	3000	3500	4000
ModCon 500 VWH @ 100′ of pipe	1 1/2″	2″	2 1/2″	3″	3″	3″	4″	4″
ModCon 500 VWH @ 250′ of pipe	2″	2 1/2″	3″	3″	4″	4″	4″	4″
Boiler Model	**1 Boiler**	**2 Boilers**	**3 Boilers**	**4 Boilers**	**5 Boilers**	**6 Boilers**	**7 Boilers**	**8 Boilers**
Cubic Ft. Hr.	850	1700	2550	3400	4250	5100	5950	6800
ModCon 850 VWH @ 100′ of pipe	2″	2 1/2″	3″	4″	4″	4″	4″	5″
ModCon 850 VWH @ 250′ of pipe	2 1/2″	3″	4″	4″	5″	5″	5″	5″

D. CHECK INLET GAS PRESSURE

The Gas Valve is equipped with an Inlet Gas Pressure Tap that can be used to measure the gas pressure to the unit. To check Gas Pressure perform the steps listed below:

1. Before you connect to the inlet pressure you must shut off the gas and electrical power to unit.
2 Loosen the pressure tap with a small screwdriver. Refer to Figures 7-2, 7-3 and 7-4 for location.
3. Each unit is equipped with a needle valve that will accept a 5/16 ID hose to connect to a digital manometer or liquid gauge to measure incoming pressure from 0-35″ w.c.
4. Turn on the Gas and Power up the unit.
5. Put the unit into manual service mode (Details on service mode in back of this manual). In service mode, monitor pressure to assure it does not drop below 1 inch from its idle reading. If Gas Pressure is out of range or pressure drop is excessive, contact the gas utility, gas supplier, qualified installer or service agency to determine correct action that is needed to provide proper gas pressure to the unit. If Gas Pressure is within normal range proceed to Step 6.
6. Exit Service mode, then turn power off and shut off gas supply at the manual gas valve before disconnecting the hose from the gas monitoring device. Tighten the screw on the pressure tap tightly and turn gas on and checks for leaks with soapy solution.

It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on the pipe to indicate a leak is present. The gas piping must be sized for the proper flow and length of pipe, to avoid pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1" w.c. (.87 kPa), the meter, regulator or gas line is undersized or in need of service. You can attach a manometer to the incoming gas drip leg, by removing the cap and installing the manometer. The gas pressure must remain between 3.5" (.87 kPa) and 14" (3.5 kPa) during stand-by (static) mode and while in operating (dynamic) mode. **If an in-line regula-**

PART 7: GAS PIPING (CONTINUED)

tor is used, it must be a minimum of 10 feet from the Mod Con. It is very important that the gas line is properly purged by the gas supplier or utility. Failure to properly purge the lines or improper line sizing, will result in ignition failure. This problem is especially noticeable in NEW LP installations and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines. This gas valve must not be replaced with a conventional gas valve under any circumstances.

E. DUNGS GAS VALVE

MOD CON 300 GAS VALVE

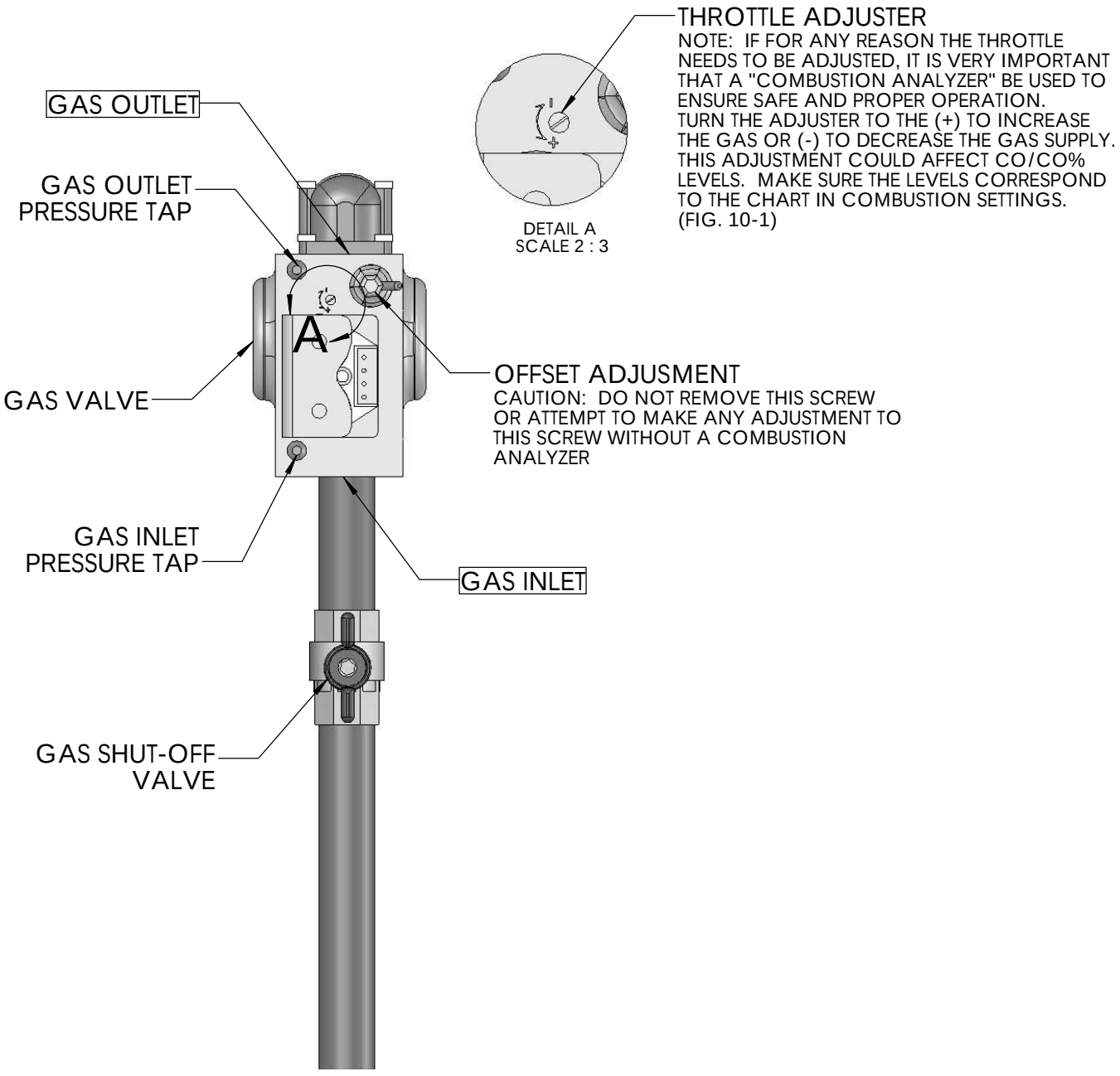

THROTTLE ADJUSTER
NOTE: IF FOR ANY REASON THE THROTTLE NEEDS TO BE ADJUSTED, IT IS VERY IMPORTANT THAT A "COMBUSTION ANALYZER" BE USED TO ENSURE SAFE AND PROPER OPERATION. TURN THE ADJUSTER TO THE (+) TO INCREASE THE GAS OR (-) TO DECREASE THE GAS SUPPLY. THIS ADJUSTMENT COULD AFFECT CO/CO% LEVELS. MAKE SURE THE LEVELS CORRESPOND TO THE CHART IN COMBUSTION SETTINGS. (FIG. 10-1)
DETAIL A
SCALE 2 : 3
GAS OUTLET
GAS OUTLET PRESSURE TAP
A
GAS VALVE
OFFSET ADJUSMENT
CAUTION: DO NOT REMOVE THIS SCREW OR ATTEMPT TO MAKE ANY ADJUSTMENT TO THIS SCREW WITHOUT A COMBUSTION ANALYZER
GAS INLET PRESSURE TAP
GAS INLET
GAS SHUT-OFF VALVE

Fig. 7-2

PART 7: GAS PIPING (CONTINUED)

MOD CON 500 GAS VALVE

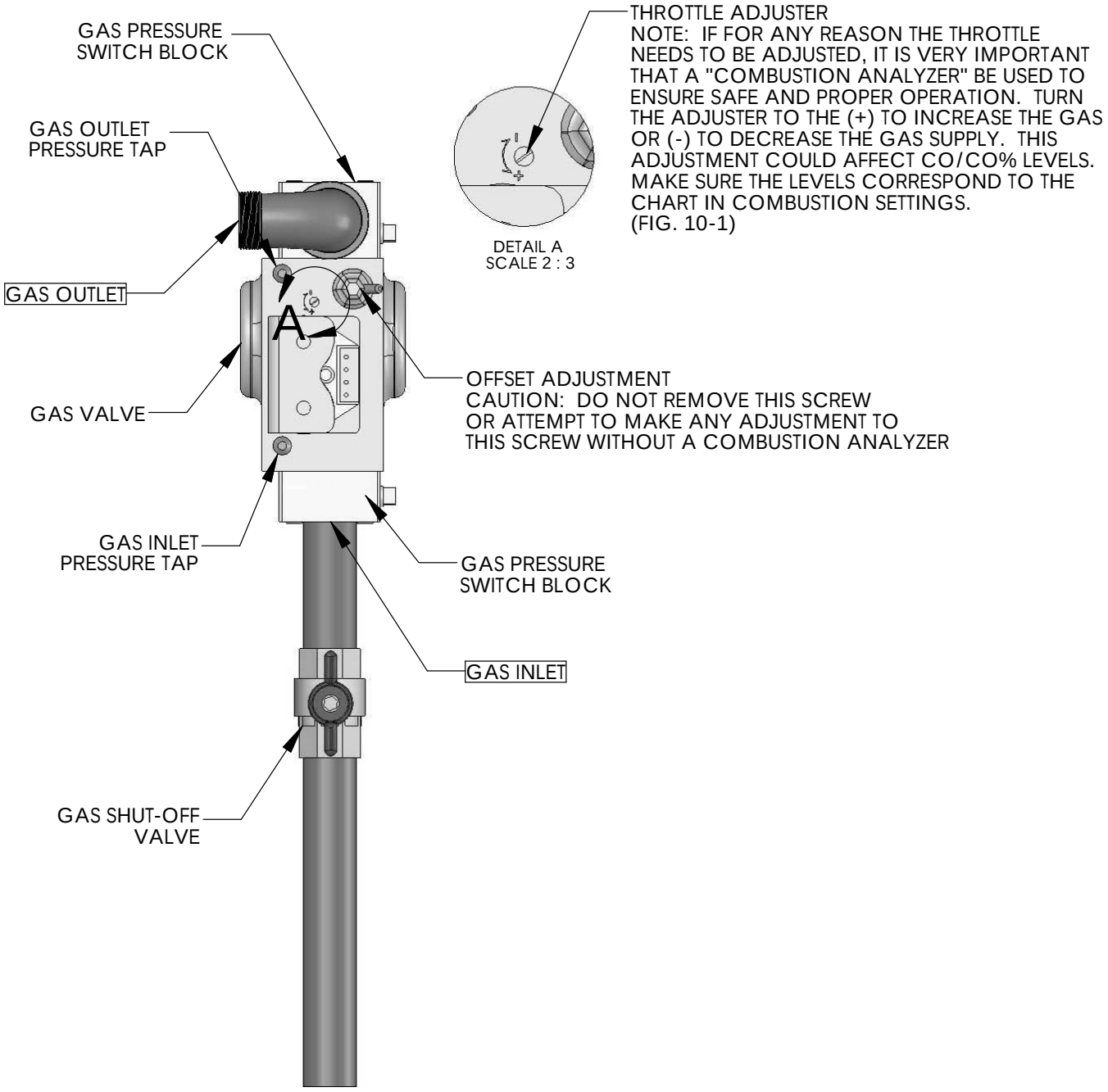

GAS PRESSURE SWITCH BLOCK
GAS OUTLET PRESSURE TAP
GAS OUTLET
GAS VALVE
GAS INLET PRESSURE TAP
GAS SHUT-OFF VALVE
THROTTLE ADJUSTER
NOTE: IF FOR ANY REASON THE THROTTLE NEEDS TO BE ADJUSTED, IT IS VERY IMPORTANT THAT A "COMBUSTION ANALYZER" BE USED TO ENSURE SAFE AND PROPER OPERATION. TURN THE ADJUSTER TO THE (+) TO INCREASE THE GAS OR (-) TO DECREASE THE GAS SUPPLY. THIS ADJUSTMENT COULD AFFECT CO/CO% LEVELS. MAKE SURE THE LEVELS CORRESPOND TO THE CHART IN COMBUSTION SETTINGS. (FIG. 10-1)
DETAIL A
SCALE 2 : 3
A
OFFSET ADJUSTMENT
CAUTION: DO NOT REMOVE THIS SCREW OR ATTEMPT TO MAKE ANY ADJUSTMENT TO THIS SCREW WITHOUT A COMBUSTION ANALYZER
GAS PRESSURE SWITCH BLOCK
GAS INLET

Fig. 7-3

LP-205-BB Rev. 6/3/08

PART 7: GAS PIPING (CONTINUED)

MOD CON 850 GAS VALVE

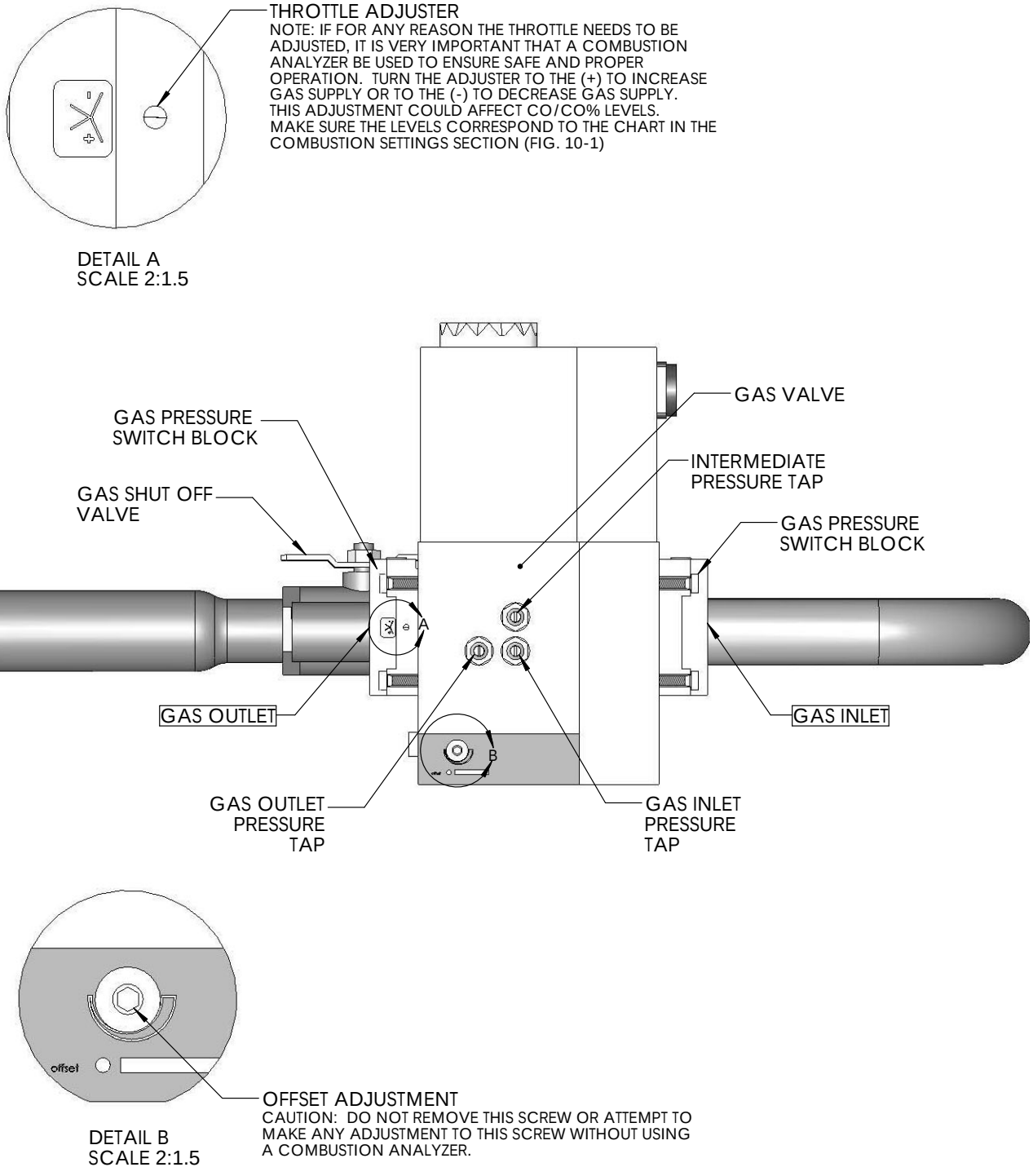

THROTTLE ADJUSTER
NOTE: IF FOR ANY REASON THE THROTTLE NEEDS TO BE ADJUSTED, IT IS VERY IMPORTANT THAT A COMBUSTION ANALYZER BE USED TO ENSURE SAFE AND PROPER OPERATION. TURN THE ADJUSTER TO THE (+) TO INCREASE GAS SUPPLY OR TO THE (-) TO DECREASE GAS SUPPLY. THIS ADJUSTMENT COULD AFFECT CO/CO% LEVELS. MAKE SURE THE LEVELS CORRESPOND TO THE CHART IN THE COMBUSTION SETTINGS SECTION (FIG. 10-1)
DETAIL A
SCALE 2:1.5
GAS VALVE
GAS PRESSURE SWITCH BLOCK
INTERMEDIATE PRESSURE TAP
GAS SHUT OFF VALVE
GAS PRESSURE SWITCH BLOCK
A
GAS OUTLET
GAS INLET
B
GAS OUTLET PRESSURE TAP
GAS INLET PRESSURE TAP
offset
OFFSET ADJUSTMENT
CAUTION: DO NOT REMOVE THIS SCREW OR ATTEMPT TO MAKE ANY ADJUSTMENT TO THIS SCREW WITHOUT USING A COMBUSTION ANALYZER.
DETAIL B
SCALE 2:1.5

Fig. 7-4

PART 8: FIELD WIRING

⚠ WARNING

ELECTRICAL SHOCK HAZARD — For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTICE

Wiring must be N.E.C. Class 1.

If original wiring as supplied with boiler must be replaced, use only TEW 105 °C wire or equivalent.

Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 — latest edition.

A. INSTALLATION MUST COMPLY WITH:

1. National Electrical Code and any other national, state, provincial or local codes or regulations.
2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

B. FIELD WIRING TERMINATIONS

All connections to the MODCON VWH boiler in the field are made inside the electrical junction box located on the side of the unit. The electrical junction box is located on the left side of the MOD CON 500 and 850 and on the right side of the MOD CON 300 units. Multiple knockout locations are available to route field wires into and out of the electrical junction box.

C. FIELD WIRING CONSIDERATIONS

NOTICE

CHECK WATER CHEMISTRY SECTION FOR ACCEPTABLE LEVELS. IF ACCEPTABLE, PUMPS MAY BE WIRED DIRECTLY TO PUMP TERMINALS. IF LEVELS ARE TOO HIGH, YOU MUST WIRE PUMPS TO LINE VOLTAGE TO RUN CONTINUOUSLY TO PREVENT LIME BUILD UP.

Pumps

The Mod/Con VWH Application requires a circulator pump for each boiler. Circulator pumps can be wired directly to the controller as shown figures 8-1/8-3/8-4 or wired directly to line voltage for continuous operation. Only wire the circulator pump to the controller if a Tank Sensor or Mechanical control can be mounted to the storage tank, otherwise circulator pumps must be wired to run continuously. The circulator pump wired to the boiler control will have a default program of a 5 minute post purge to provide stabilization and post cleaning of the heat exchanger. The boiler control is capable of supplying 120 volts at up to 3 amps to run the circulator pump. If using a larger circulator pump requiring more than 3 amps or higher voltage, an external motor starter, sized appropriately for the pump motor must be used. This starter should have a 120 VAC coil. If a starter with 120 VAC coil is used, it can be wired directly to the appropriate pump terminals as shown on figures 8-1 / 8-3/8-4 Mod/Con VWH.

Tank and Sensor Connections

When the MOD CON VWH is used in a single boiler installation, it is recommended to use a sensor (7250P-325) placed in a well in the storage tank for the best temperature control. If multiple tanks are used in the installation, it is recommended to put a mechanical aquastat in each tank and wire them in series to provide temperature control of the tanks. See piping/sensor diagrams in Part 5 section G for reference. The control in the MODCON VWH will read either the temperature of the tank sensor or the status of the aquastats and cause the boiler to run until the water temperature of the tank is at the desired set point. If a sensor or aquastat cannot be placed directly in the tank, then one sensor should be used on the pipe carrying the water from the tank(s) to the boiler. This sensor should be placed as close to the tank(s) as possible in the common piping to minimize loss of temperature in the piping. The use of a pipe sensor will be somewhat less accurate than using a sensor in the tank and has the disadvantage of requiring the boiler pump(s) to run continuously so the sensor is always measuring the temperature of the water that is in the tank.

In a multiple MODCON VWH installation, where the boilers are connected for cascade operation, a system sensor is needed in addition to the tank or pipe sensor described above. The system sensor is mounted on the common pipe to

PART 8: FIELD WIRING (CONTINUED)

the tank(s) from the boilers as close to the tank(s) as possible. The purpose of this sensor is to serve as feedback to the control to provide it with the aggregate temperature of all boilers firing. The master boiler control will then fire the boilers in cascade sequence to maintain the water in this pipe at the appropriate temperature to provide correct heating of the tank.

The electrical junction box has separate, clearly marked terminal strips for line voltage and low voltage wiring. Special jacks are provided for trouble-free cascade system wiring using standard CAT3 or CAT5 patch cables.

D. LINE VOLTAGE WIRING FOR MODCON VWH

Connect the incoming power wiring to the line voltage terminal strip in the electrical junction box at terminals LINE 120V, Neutral, Ground (Shown in Fig. 8-1). A line voltage fused disconnect switch may be required to be externally mounted and connected according to local wiring codes that may apply.

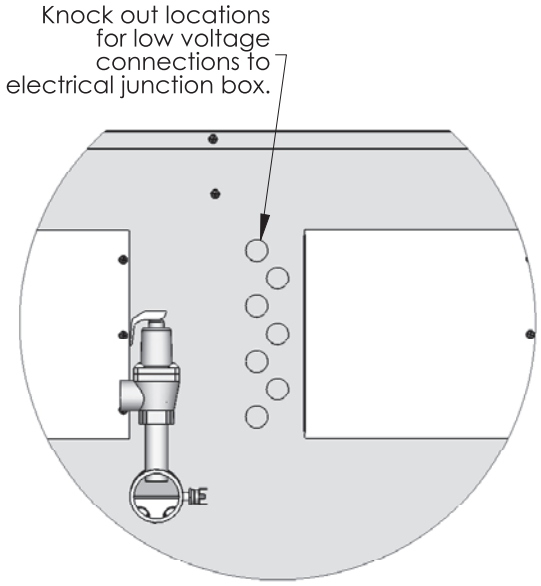
If the pump used for the boiler operates at 120 volt and less than 3 amps is required, it may be connected directly to the terminals marked BOILER HOT, BOILER NEUT, BOILER GRD. If the pump operates at a voltage other than 120 volts and/or it requires more than 3 amps, an external motor starter must be used to operate the pump. If the starter is equipped with a 120 volt coil, the coil connections may be connected directly to the terminals marked BOILER HOT and BOILER NEUT. Refer to Fig 8-1a for a representative drawing of this configuration. If a motor starter is used, it should be selected, installed and wired in compliance with all local electrical codes and requirements. In the absence of such codes or requirements, the National Electrical Code (NFPA 70) should be followed.

E. ALARM CONNECTIONS

The MOD CON control includes a dry contact alarm output. This is an SPDT circuit, rated at 5 amps at 120 volts. This contact can be used to activate an alarm light or bell or notify a building management system if the boiler goes into a lockout condition. The circuit between the ALARM COM and NC terminals is closed during normal operation and the circuit between ALARM COM and NO is open during normal operation. The connections depicted in figure 8-1 show two 120 volt lights connected to the alarm terminals. One light will be on when the boiler is in normal mode and the other light will be on when the boiler is in lockout mode.

F. LOW VOLTAGE CONNECTIONS FOR STANDARD BOILER

1. All low voltage cables should enter the electrical junction box through the provided knock out holes as shown below.
2. Connect all low voltage field devices to the low voltage terminal strip located in the electrical junction box (shown in Figure 8-1).



PART 8: FIELD WIRING (CONTINUED)

MOD CON VWH CONTROL

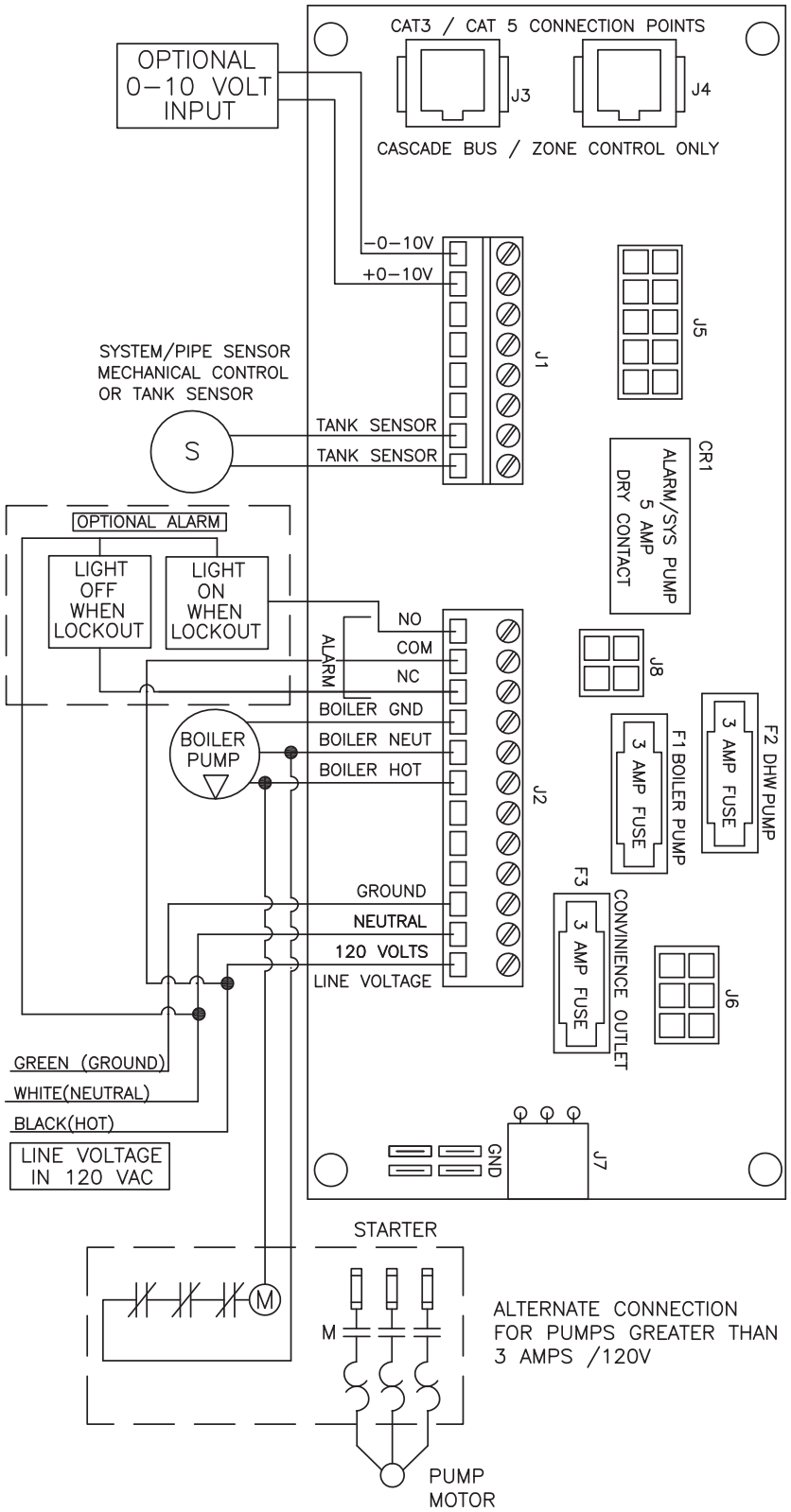


Fig. 8-1

PART 8: FIELD WIRING (CONTINUED)

G TANK SENSOR OR MECHANICAL CONTROL

Connect the tank sensor or mechanical controls to the TANK SENSOR terminals of the low voltage terminal strip as shown in Fig. 8-1. The control will automatically determine which type of sensor is connected and will operate accordingly. Caution should be used to ensure that neither of these terminals becomes connected to ground.

H. SYSTEM / PIPE SENSOR

The System/Pipe sensor can be used to control the temperature of the storage tank when a Tank Sensor or Mechanical control cannot be mounted. The System/Pipe Sensor would be wired into the terminals of the low voltage terminal strip as shown on figure 8-1. It is important to note that when a System/Pipe Sensor is used, the circulating pump must be wired to operate continuously, otherwise the boiler will short cycle.

The System/Pipe sensor can also be used in a Cascade System when the sensor is placed on the supply line of multiple boilers that feed the storage tank. This will control the temperature and modulate the firing rate of the connected boilers. The System/Pipe Sensor would then be wired into the Master Boiler terminals on the low voltage strip as shown on figure 8-3.

I. OPTIONAL HIGH GAS PRESSURE SWITCH

1. If an optional high gas pressure switch is used, it should be installed on the outlet side of the gas valve. This is normally closed and will open if the pressure goes above 1.5" w.c. on the outlet side.
2. Locate the two pigtails hanging from the electrical box inside of the boiler cabinet. Remove and discard the jumper plug from one of the unused pigtails.
3. Connect the high gas pressure switch to the pigtail that you removed the jumper plug from.

J. OPTIONAL LOW GAS PRESSURE SWITCH

1. If an optional low gas pressure switch is used, it should be installed on the inlet side of the gas valve. This is normally closed and will open if the pressure goes below 1" w.c. on the inlet side.
2. Locate the two pigtails hanging from the electrical box inside of the boiler cabinet. Remove and discard the jumper plug from one of the unused pigtails.
3. Connect the low gas pressure switch to the pigtail that you removed the jumper plug from.

K. FLOW SWITCH

The MODCON VWH boiler requires the use of a flow switch. The flow switch kit 7350P-605 or 7350P-606 is part of the VWH conversion process and comes packaged with detailed installation instructions which should be read and followed to ensure a functional system

PART 8: FIELD WIRING (CONTINUED)

L. WIRING OF CASCADE SYSTEM COMMUNICATION BUS

1. Use standard CAT3 or CAT5 computer network patch cables to connect the communication bus between each of the boilers. Use standard 'straight through' cables for these connections. **Do not** use crossover cables. These cables are readily available at any office supply, computer, electronic, department or discount home supply store in varying lengths. If you possess the skills you can also construct custom length cables.
2. It is recommended to use the shortest length cable that will reach between the boilers and create a neat installation. Do not run unprotected cables across the floor or where they will become wet or damaged. Avoid running communication cables parallel and close to or against high voltage (120 volt or greater) wiring. HTP recommends that the maximum length of communication bus cables not exceed 200 feet.
3. Route the communication cables through one of the knockouts in the cabinet.
4. Connect the boilers in a daisy chain configuration as shown below. It is best to wire the boilers using the shortest wire runs rather than trying to wire them in the order that they are addressed. The communication bus jacks on the customer connection panel are interchangeable so you can use either one or both in any order to connect the cable to. If you have connected the boilers to each other properly, two of the boilers will have one open connection port on them.

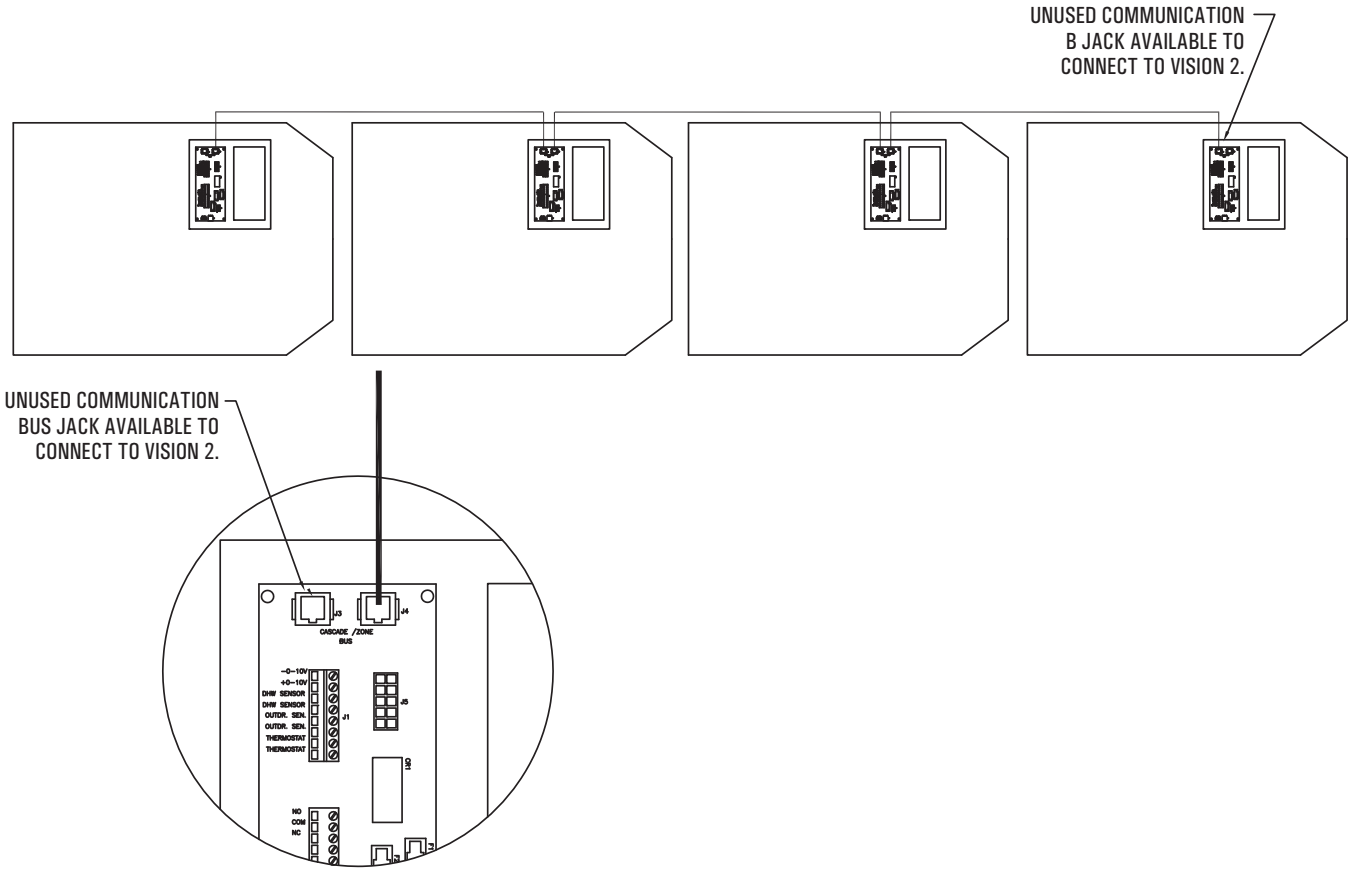


Fig. 8-2 LP-205-JJ

PART 8: FIELD WIRING (CONTINUED)

MOD CON VWH Cascade Master

NOTE:
You must place the Cascade Master label (included in shipping envelope) on top of the Standard Mod Con Control

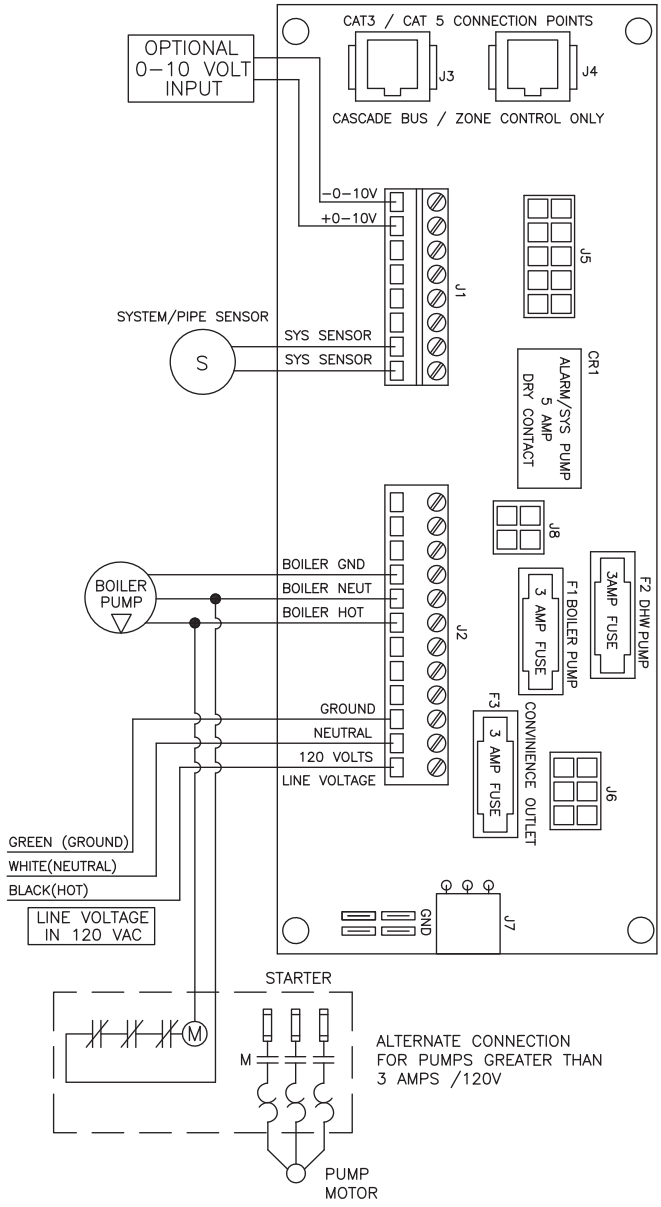


Fig. 8-3

LP-248-VWH Rev. 7/17/09

M. MODCON VWH CASCADE MASTER PUMP AND SENSOR WIRING

1. Place the Cascade Master Overlay Sticker onto the field connection board on the boiler designated as the Cascade Master
2. If it is desired to have the boiler control the boiler pump, Connect the boiler pump to the BOILER HOT, BOILER NEUT, BOILER GND terminals
3. Connect the System sensor to the terminals marked SYS SENSOR
4. Do not connect anything to the OUTDOOR SENS or THERMOSTAT terminals
5. If 0–10 volt input is used, connect to marked terminals.

PART 8: FIELD WIRING (CONTINUED)

MOD CON VWH Cascade Follower

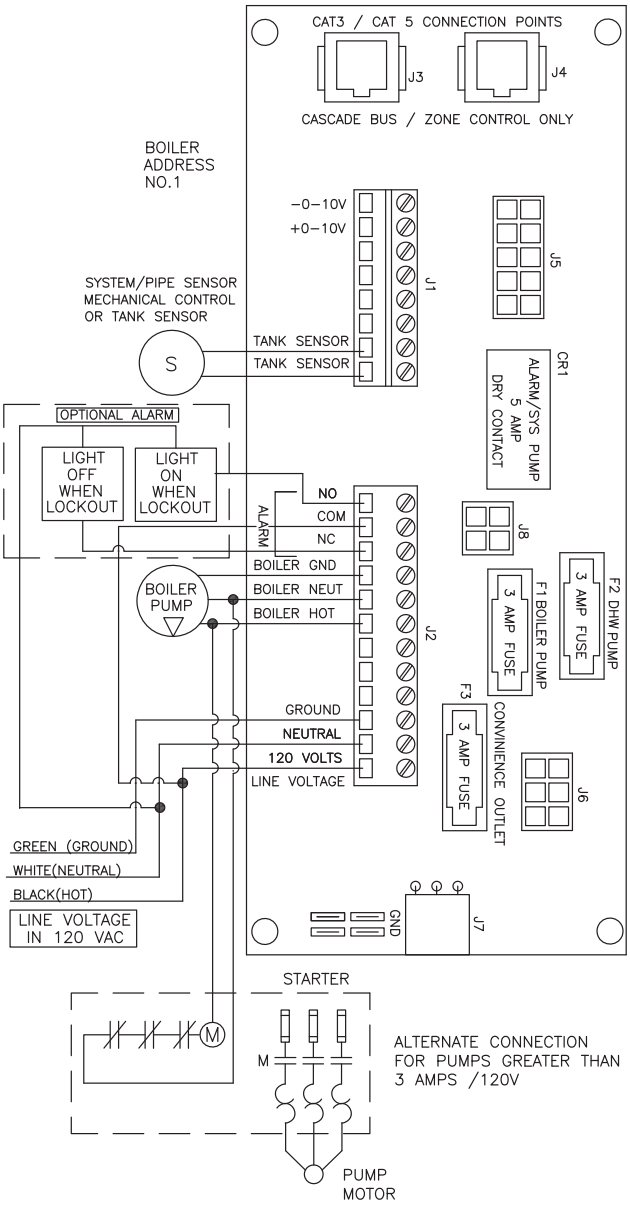


Fig. 8-4

LP-248-VWH Rev. 7/10/09

N. MODCON VWH CASCADE FOLLOWER PUMP AND SENSOR WIRING

1. If it is desired to have the boiler control the boiler pump, Connect the boiler pump to the BOILER HOT, BOILER NEUT, BOILER GND terminals
2. Connect the tank sensor(s) or return sensor to the terminals marked TANK SENSOR on the follower boiler addressed as 1. There are no connections to these terminals on other follower boilers in the system.
3. Do not connect anything to the OUTDOOR SENS, 0-10V or THERMOSTAT terminals.
4. If it is desired to monitor the boiler system to detect a lockout condition, a dry contact alarm relay is provided. Please see Figure 8.4 for wiring suggestions for this relay. Note that the alarm output of the boiler addressed as 1 will be active for lockout alarms both on boiler 1, as well as on the master boiler.

PART 8: FIELD WIRING (CONTINUED)

MOD CON INTERNAL CONNECTION DIAGRAM

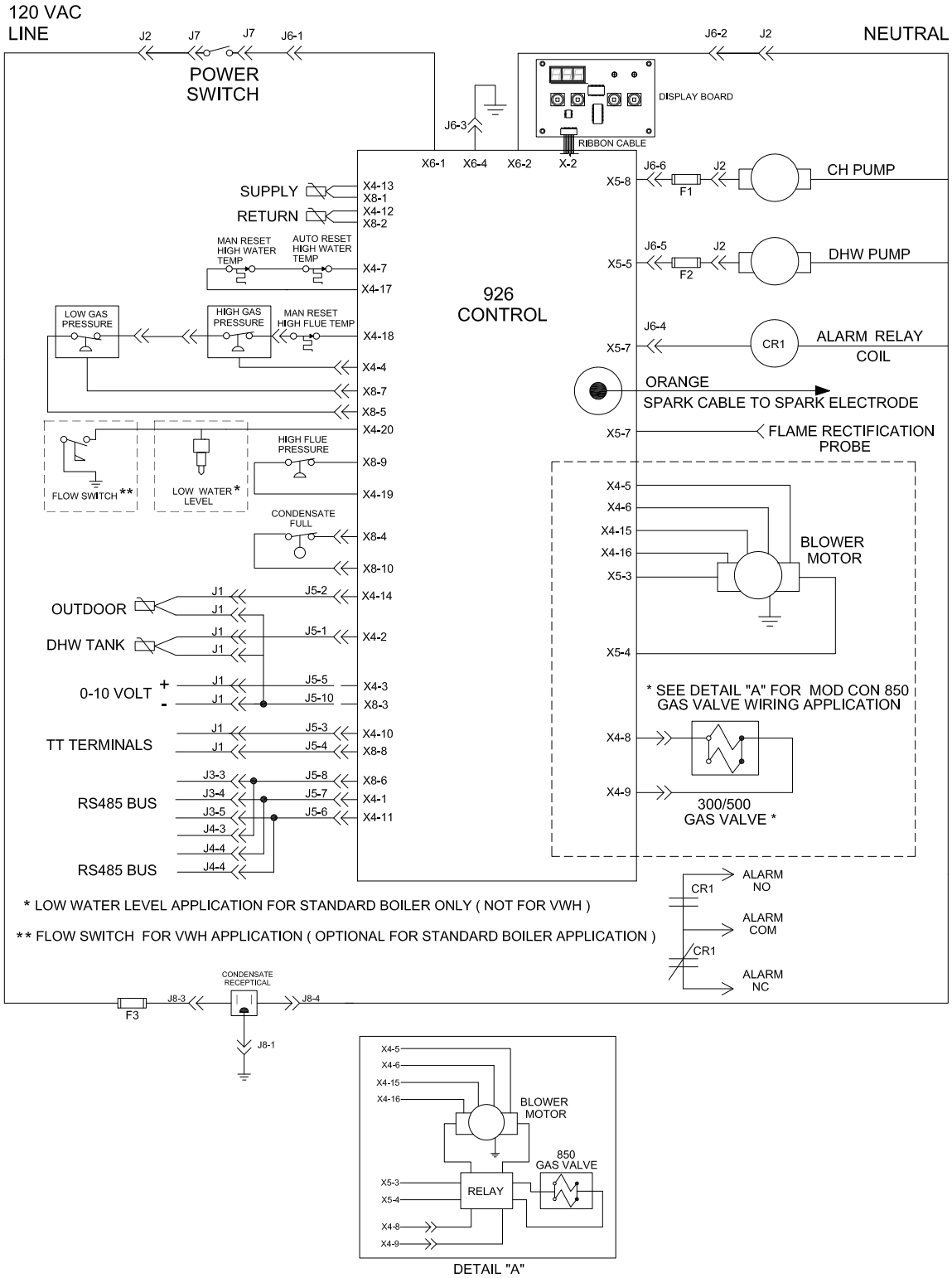


Fig. 8-5

LP-255 Rev. 11/09/09

PART 9. START-UP OPERATION

A. SINGLE MOD CON VWH BOILER

When power is applied to the MODCON VWH boiler, the control first completes a power-up systems check. During this time, the combustion fan may run. The display will initially show the current boiler outlet temperature. If a fault is detected during the power-up test time, the control will display the appropriate fault code. If all is well, the display will continue to show the boiler outlet temperature and stand by waiting for a demand for hot water. If the temperature of the tank sensor falls to below the tank set point/ **dd** - tank differential **dh** temperature, a demand for hot water is generated by the control. When a demand for hot water is received, the control begins the following the demand sequence. The control will energize the pump output then wait for adequate water flow to pass through the flow switch. If the flow is not sufficient, the display will show **FL** until the flow is sufficient. Once the flow through the boiler is adequate, the control will then measure the boiler supply temperature and if it is below the set point temperature **dd** – the supply hysteresis **Sh** temperature, the control will ignite the burner. Once the boiler is lit, the control will modulate the firing rate to control the supply water temperature to be at the supply offset temperature (installer #4) above the tank set point temperature **dd**. When the tank temperature is equal to the tank set point temperature, the control will extinguish the burner and allow the combustion fan to run for a time to purge gas from the combustion chamber. The control will then be in stand-by waiting to process the next demand for heat. In the event that the control goes into lockout, it will close the alarm contacts, show a diagnostic code on the display, and illuminate the LED fault indicator to assist in trouble shooting the failed condition. If you have an alarm connected to the alarm contacts it will be activated.

B. MULTIPLE MOD CON VWH BOILERS

If the MODCON VWH boiler is part of a cascaded boiler system, then the operation is somewhat different. The control of each boiler in the cascaded system completes its own power up systems check as described above. One of the boilers in the cascade system is designated as the master boiler. After the master boiler completes its power up sequence, it checks the communication bus to see if any other boilers are present and if there are boilers present, the master control determines their boiler address. The master boiler control will re-check the bus every few seconds as long as it is powered up to update the status of the connected boilers. The control in the master boiler is the one that processes all heat demands and dictates which of the follower boilers should light and at what firing rate the followers should run at. When the master boiler receives a demand for heat, it determines which boiler is the first in the firing sequence and sends that boiler a command to begin a demand sequence. That boiler will then begin a demand sequence exactly as described above. Once that boiler ignites, the master boiler control will increase the firing rate of that boiler until the system sensor temperature is at the supply offset temperature (master boiler installer #4) above the tank set point temperature or that boiler is at high firing rate. If the boiler gets to a high firing rate but the system sensor is not at the desired temperature, the master boiler control will then tell the next boiler in the firing sequence to begin its demand sequence. The second boiler will then begin to ramp up in firing rate based on commands from the master boiler control. This process will continue while there is a demand, until either all boilers in the cascade system are at high fire or the desired temperature at the system sensor is reached. When the tank temperature is equal to the set point temperature the demand is complete and the master boiler control will extinguish all boilers that may be lit. If any boiler or multiple boilers, including the master boiler in the cascade system are in a lockout condition, the master control will recognize the lockout condition and skip over the boiler in the firing sequence. Each boiler in the cascade system is responsible for its own safety functions so if any individual boiler control senses an unsafe condition it will extinguish the boiler and if necessary, put it in lockout condition. In this way, every boiler in the system has its individual safety controls intact and operational even if the firing of the boiler is under control of the master boiler. In the event that the system sensor fails, all boilers in the system will ignite simultaneously when there is a demand and they will regulate their firing rate individually to maintain the master set point temperature (tank set point + master boiler installer #4) at their individual supply sensors

PART 9. START-UP PREPARATION (CONTINUED)

built into the boiler. If this should happen, the master boiler will display an E03 fault code indicating that the supply sensor has failed.

C. CHECK FOR GAS LEAKS

⚠ WARNING

Before starting the boiler, and during initial operation, smell near the floor and around the boiler for gas odorant or any unusual odor. Remove boiler front door and smell interior of boiler enclosure. Do not proceed with startup if there is any indication of a gas leak. Repair any leak at once.

⚠ WARNING

Propane boilers only — Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

D. CONDENSATE REMOVAL

1. The Mod Con Boiler is a high efficiency condensing boiler, therefore, the unit has a condensate drain. Condensate fluid is nothing more than water vapor, derived from combustion products, similar to an automobile when it is initially started. The condensation is slightly acidic (typically with pH of 3 to 5) and must be piped with the correct materials. Never pipe the condensate using steel, copper, brass or other materials that will be subject to corrosion. Plastic PVC or CPVC pipe are the only approved materials. A condensate filter, if required by local authorities, can be made up of lime crystals, marble or phosphate chips that will neutralize the condensate. This may be done by the installer or you may purchase a condensate neutralizer from Heat Transfer Products, Inc. (P/N S7350-025)
2. The Mod Con Boiler is equipped with a ¾ FPT connection that must be piped to a local drain. It is very important that the condensate line is sloped downward away from the Mod Con to a suitable inside drain. If the condensate outlet on the Mod Con is lower than the drain, you must use a condensate removal pump, available from Heat Transfer Products (#554200). This pump is equipped with two leads that can be connected to an alarm or another type of warning device to alert the user of a condensate overflow, which, if not corrected, could cause property damage.
3. If a long horizontal run is used, it may be necessary to create a vent in the horizontal to prevent a vacuum lock in the condensate line.
4. Do not expose the condensate to freezing temperatures.
5. It is very important you support the condensation line to assure proper drainage.

E. FINAL CHECKS BEFORE STARTING BOILER

1. Read Startup Procedures within this manual for proper steps to start boiler. (See Startup Report to record steps for future reference.)
2. Verify the boiler and system are full of water and all system components are correctly set for operation.
3. Fill condensate trap with water.
4. Verify electrical connections are correct and securely attached.
5. Inspect intake piping and exhaust piping for signs of deterioration from corrosion, physical damage or sagging. Verify intake piping and exhaust piping are intact and correctly installed per Venting section and local code.

F. CASCADE SYSTEM

1. If the boiler is used in a stand alone configuration, skip this section.
2. Programming The Master Boiler
    1. Make sure there is no demand for heat being supplied to the boiler
    2. Apply power to the boiler
    3. Enter the installer Menu following instructions in Part 11 of this manual.
    4. Verify that parameter 15 is set to 0. This makes the master boiler address 0. NOTE: The Master Boiler MUST be addressed as 0.

PART 9. START-UP PREPARATION (CONTINUED)

5. Change parameter 23 from 0 to 1. This makes it the master boiler.
6. Exit the installer menu

NOTE: The temperature set point of the master must match the follower boiler set point in order for the system to operate properly.

3. Follower Boilers

NOTE: READ THE NOTES BELOW BEFORE PROGRAMMING FOLLOWER BOILERS:

- The boiler addressed as 1 will share its alarm output with the master boiler
- It is recommended but not necessary to address boilers in the order that they are wired.
- No two boilers can have the same address
- It is not required to use all consecutive address numbers. Example: In a 2 boiler system with an indirect connected to the follower the follower address would be 2 (address 1 not used)

1. Make sure there is no demand for heat being supplied to the master boiler
2. Apply power to the follower boiler you are working on
3. Enter the installer Menu following instructions in part 11 of this manual
4. Set parameter 15 to 1 for the first follower, 2 for the second follower, etc. depending on which boiler you are programming.
5. Verify that parameter 23 is set to 1. This makes the boiler be a follower.
6. Exit the installer menu

NOTE: The temperature set point of the follower must match the master boiler set point in order for the system to operate properly.

PART 10. START-UP PROCEDURE

FOR YOUR OWN SAFETY READ BEFORE OPERATING

1. This appliance does not have pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.
- Turn off gas shutoff valve (located inside of the Boiler) so that the handle is crosswise to the gas pipe. If the handle will not turn by hand, don't try to force or repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

4. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
5. The Mod Con Boiler shall be installed so the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.)

A. OPERATING INSTRUCTIONS

Remove boiler cover. If you smell gas, **STOP.** Follow listed safety instructions. If you do not smell gas, follow the next steps.

1. Turn on all electric power to appliance.
2. Adjust the temperature setpoint of the Mod Con VWH Boiler if desired. The factory default setting is 180°. If changes are necessary follow “Adjusting The Mod Con Setpoint” in this section.
3. On the intial start-up of this boiler, you may note a lock-out code of **F01**. This is a low gas pressure switch lock-out from the factory-installed low inlet gas pressure switch (located on the left for the Mod Con 500 and on the right for the Mod Con 850). You will also see a yellow LED illuminated under the cover of the inlet gas pressure switch. Once the gas is turned on, reset the gas pressure switch by **FIRMLY** pressing on top of the plastic cover over the red reset button. You will note that yellow LED has now gone out. Press and hold the S4 key on the control panel for about 4 seconds to begin normal operation.
4. If the tank water temperature is below the tank set point temperature (tank differential temperature), the boiler will ignite.
5. If the appliance fails to start, refer to the Troubleshooting section in the back of this manual.

B. ADJUSTING THE OPERATING SET POINTS OF THE VWH DISPLAY

To adjust the temperature set point, differential values, and display units of the VWH Boiler, press the S3/Program key for three seconds until you see Sh then an alternating value of 7°F. Use the S1/– key or S2/+ key on the display to either increase or decrease the setting of each parameter. Use the S3/Program button to advance to each parameter listed in the chart below. Pressing the S3/Program when you are at the last parameter on the chart will return the display to normal operation. If you missed a parameter or want to make further changes, simply again press and hold the S3/Program key for 3 seconds to enter the programming mode.

PART 10. START-UP PROCEDURE (CONTINUED)

Set Point Adjustment			
Function	**Display**	**Default Setting**	**Range of Adjustment**
Supply Sensor Differential	sh	7° F	1–45° F
Temperature Set Point	dd	119° F	80° F/185° F
Tank Sensor Differential	dh	7° F	1–45° F
Measurement Units	t	Fahrenheit to Celcius	F or C

Settings when using a tank or pipe sensor

Parameter **t** should be set to F for Fahrenheit temperatures or C for Celcius temperatures

Parameter **dd** should be set to the desired tank temperature. If you are using 0-10 volt control, parameter **dd** should be set to the tank temperature corresponding to a 10 volt input signal.

Parameters **sh** and **dh** should both be set to the number of degrees below the desired tank temperature that you want the MODCON VWH boiler(s) to start firing at.

Settings when using a mechanical tank or pipe sensor

The mechanical sensor should be set to the desired tank temperature

Parameter **t** should be set to F for Fahrenheit temperatures or C for Celsius temperatures

Parameter **dd** should also be set to the desired tank temperature.

Parameter **sh** should be set to the number of degrees below the desired temperature that you want the MODCON VWH boiler(s) to begin firing at. This is useful if you desire a greater differential temperature than what is designed into the mechanical control

Note: Parameter **dh** is not used when using a mechanical tank or pipe sensor.

Note: When using a mechanical control on the storage tank, it is recommend that the temperature set-point on the VWH boiler is set 5°F above the setting of the mechanical control located on the storage tank. The VWH will modulate its firing rated based on the supply temperature sensor until the mechanical control temperature set point is reached.

⚠ DANGER

Water temperature over 125 degrees F. can cause severe burns instantly, or death from scalds. Children, disabled, and elderly are at highest risk of being scalded. See instruction manual before setting temperature at water heater. Feel water before bathing or showering! Temperature limiting valves are available.

C. STATUS MENU

Installers are also able to check the current status of the Munchkin parameters by pressing S4/Reset key for 3 seconds. Once activated, the display will show **d1** alternating value of the actual outlet temperature. Actual values are displayed for each function. To view the next value simply press the S/4 key to go to the next displayed value. Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, simply press S3/Program key to resume normal operation.

Function	Value
d1 —	Actual Temperature from supply sensor
d1/	Actual Temperature from outlet sensor
d2/	Actual Temperature from inlet sensor
d3/	If using a standard mechanical control, the control will display **0** for closed and **1** for open. If the tank sensor is connected to the SuperStor storage tank, it will measure the actual temperature
d4/nc	(Not used)
d5/nc	(Not used)
d6/	Actual Fan speed multiplied by 10 (example: If fan speed displayed is 410 RPM x 10 = 4100 actual fan speed)
d7/	Actual Ionization current read from Flame Rectification probe
d8/	0 (Not used)
d9/	Circulator pump **0** = Off **1** = On
d10/	**Co** – Established connection **nc** – No bus communication
d11/	Storage tank setpoint

PART 10. START-UP PROCEDURE (CONTINUED)

Function Value

d12/ Power on in hours (display will not read until 100 hrs.)
Example : Display number x 1000 = Power on Hours

d13/ NA

d14/ Total running hours of boiler(s) (display will not read until 100 hrs)

d15/ Passed ignition attempts in thousands (display will not read until 100 ignition attempts)
Example: Display number x 1000 = Ignition attempts
Display showing12.3 x 1000 = 12300 Ignition attempts

System Circulator Pump - **0** off or **1** on

Master Boiler - **P0** alternating (0-100 Percentage firing rate)

Follower Boiler #1 – **P1** alternating (0-100 Percentage firing rate)

Follower Boiler #2 – **P2** alternating (0-100 Percentage firing rate)

Follower Boiler #3 – **P3** alternating (0-100 Percentage firing rate)

Follower Boiler #4 – **P4** alternating (0-100 Percentage firing rate)

Follower Boiler #5 – **P5** alternating (0-100 Percentage firing rate)

Follower Boiler #6 – **P6** alternating (0-100 Percentage firing rate)

Follower Boiler #7 – **P7** alternating (0-100 Percentage firing rate

NOTE: If you toggle beyond parameters of connected boilers, the display will go into the next function value.

D. TEST MODE

This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each Mod Con Boiler and the Combustion Settings. Automatic modulation does not take place when the controller is in Test Mode, only temperature limitation based on the Mod Con Boiler Central Heating set point occurs. The user can increase or decrease the fan speed by pressing in either the S1/– or S2/+ keys.

To activate the Test mode, press the S2/+ and S3/Program key together for 1 second. Once activated, you will see in the display Ser and the actual fan speed. The measurement of the combustion levels should always be taken at the highest and lowest fan speed. After 20 minutes, the Test Mode stops automatically. To exit Test Mode press S1/– and S2/+ key together for 1 second.

COMBUSTION SETTINGS ON ALL MODELS				
	Natural Gas		Propane LP	
Fan Speed	low	high	low	high
Carbon Monoxide (CO %)	0–20 ppm	70 ppm–135 ppm	0–20 ppm	80 ppm–150 ppm
Carbon Dioxide (CO_2 %)	8½% – 9½%	8½% – 9½%	9½% – 10½%	9½% – 10½%

Fig. 10-1

PART 11: START-UP PROCEDURES FOR THE INSTALLER

A. PROGRAMMING FOR THE INSTALLER

This section describes each parameter the installer can access to customize the settings of the Mod Con Boiler for a particular installation. These system limits should not be changed by the user. It is important to document your settings within this manual after you program the sytem parameters so this will be recorded for future reference. Record settings in Fig. 11-1.

B. PROGRAM ACCESS

To start, press down and hold the S/3 and S/4 simultaneously for three seconds. The display will change to 000. Then, with your S1/– key on the display, press down until you see 925. This is the pass code. To confirm that the pass code is correct, you will need to press and hold the S3/Program for 1 second to confirm. If the pass code is entered incorrectly, the controller program function will be cancelled and the control returns

PART 11: START-UP PROCEDURES FOR THE INSTALLER (CONTINUED)

to normal operation. If the code is entered correctly, the control will switch off the gas valve and purge fan while showing a solid ––– in the display. The display will then show a 1 alternating to dd. This first function verifies that the control is configured as a VWH boiler.

C. PROGRAM NAVIGATION

Next you will have to press the S/3 key to move through each function. To increase or decrease a value, you will need to press either the S/1– key or S/2+ key to change the default values. If there is no key action for 1 minute, the display returns to normal operation. Changes are effective immediately but not directly stored until the S/4 key is pressed down for 3 seconds then the new values are stored. Listed below are the variety of functions the installer can program into the 926 Control.

CAUTION

The Boiler cannot be programmed while there is a call for heat.

Function Number	Default Value	Function Description
1	dd	No change allowed
2	149°F	No change allowed
3	180˚	Maximum Domestic water heater delivery temperature allowed in user menu. Installer can set the maximum temperature. Range 95-185
4	20°F	Offset temperature / number of degrees above the tank set point that will control the boiler output. Ex. Storage tank set at 120° with 20° offset boiler supply will be 140°. Range 1-39
5	7°F	Allows the installer to change the differential temperature (dh) Range 1-18
6	5 Min.	Circulator Post Purge Time after tank sensor is satisfied that the pump will run (Note: it is recommend that Circulator Post Purge Time be set no greater than 5 minutes). Range: 0 to 10 minutes
7	68	N/A (No change required)
8	5	N/A (No change required)
9	180	N/A (No change required)
10	68	N/A (No change required)
11	95	N/A (No change required)
12	68	N/A (No change required)
13	0	N/A (No change required)
14	30	N/A (No change required)
15	0	Bus Addressing Boilers (Cascade 8 Boiler Max.) Master = Address 0 / Followers = Address 1 thru 7. Note: Never address boiler with number 8 which is not to be used. Range: 0-8
16	0	Allows the installer to connect up a 0-10 Volt signal directly from Building Management System. To activate, change value to 2. Warning: Values 1 and 3 are not to be programmed into board Range: 0-3
17	0	N/A (No change required)
18	1	N/A (No change required)
19	180	N/A (No change required)
20	2	Flow switch. Do not change 0= none 1=water pressure switch 2=flow switch 3=low water cut-off
21	0	N/A (No change required)
22	100%	Maximum boiler output percentage. Default = 100%. This parameter can be adjusted to lower the maximum boiler output if necessary. Example MOD CON 500 boiler setting at 80% boiler will go to 400000 BTU/hr max rather than 500000 BTU/hr. Range 50–100%

PART 11: START-UP PROCEDURES FOR THE INSTALLER (CONTINUED)

Function Number	Default Value	Function Description
23	0	Cascade configuration default 0. Change this to 1 if the boiler is in a cascade system. Range 0-1
24	24	Power on hours for cascade priority change over. This parameter is used to set how many power on hours will go by before the priority boiler will be rotated in the cascade system. Range 0-240
25	0	Not applicable, must be at 0
26		––
27	0	Parameter set on 0 then **E03** will be displayed if system sensor fails. Parameter set on 1, no code will be displayed if system sensor fails. 0 = **E03** 1 = no code displayed
28	0	Parameter set on 0 frost protection active Parameter set on 1 frost protection disabled 0 = Frost protection active 1 = Frost protection disabled
29	0	N/A (No change required)
30	0	Parameter is set on 0 there will be no extra boiler on Cascade Master. When parameter is greater than 0, this is the percentage of the cascade output that the auxiliary boiler will turn on.

CONTROL PROGRAM REFERENCE CHART		
Function	Default Setting	Programmed Setting
1	dd	No change allowed
2	149°F	No change required
3	180°F	
4	20°F	
5	7°F	
6	5	
7	68°F	N/A (No change required)
8	5	N/A (No change required)
9	180	N/A (No change required)
10	68	N/A (No change required)
11	95	N/A (No change required)
12	68	N/A (No change required)
13	0	N/A (No change required)
14	3	N/A (No change required)
15	0	
16	0	
17	0	N/A (No change required)
18	1	N/A (No change required)
19	180	N/A (No change required)
20	2	
21	0	N/A (No change required)
22	100%	
23	0	
24	24 hrs.	
25	0	N/A (No change required)
26	– –	
27	0	
28	0	
29	0	N/A (No change required)
30	0	

Fig. 11-1

PART 12: TROUBLESHOOTING

A. MOD CON ERROR CODE

If any of the sensors detect an abnormal condition or an internal component fails during the operation of the Mod Con Boiler, the display may show an error code. This code may either be the result of a temporary condition in which case the display will revert to its normal readout when the condition is corrected or it may be the result of a condition that the controller has evaluated as not safe to restart the boiler. In this case, the boiler control will be locked out, requiring the maintenance person to manually reset the control by pressing the S4/RESET button for more than 1 second. Typically, if the display has a code beginning with F followed by 2 numbers the Mod Con Boiler is locked out. If the display has a 3 letter code it is the result of a temporary condition.

B. BOILER ERROR

When an error condition occurs, the controller will display an error code on the display module.

These error codes and several suggested corrective actions are included in Table 12-1.

C. BOILER FAULT

1. When a fault condition occurs the controller will illuminate the red “fault” indication light and display a fault code in the format. The alarm output will also be activated. Most fault conditions will also cause the CH pump to run in an attempt to cool the boiler.
2. Note the fault code and refer to Table 12-2 for an explanation of the fault code along with several suggestions for corrective actions.
3. Press the reset key to clear the fault and resume operation. Be sure to observe the operation of the unit for a period of time to assure correct operation and no re-occurrence of fault codes.

⚠ WARNING

When servicing or replacing any components of this boiler be certain that:
- **The gas is off.**
- **All electrical power is disconnected**

PART 12: TROUBLESHOOTING (CONTINUED)

⚠ DANGER

When servicing or replacing components that are in direct contact with the boiler water, be certain that:
• There is no pressure in the boiler. (Pull the release on the relief valve. Do not depend on the pressure gauge reading).
• The boiler water is not hot
• The electrical power is off

⚠ WARNING

Do not use this appliance if any part has been under water. Improper or dangerous operation may result. Contact a qualified service technician to inspect the boiler and to repair or replace any part of the boiler that has been under water prior to placing the boiler back in operation.

⚠ CAUTION

This appliance has wire function labels on all internal wiring. Observe the position of each wire before removing it. Wiring errors may cause improper and dangerous operation. Verify proper operation after servicing.

⚠ CAUTION

If overheating occurs or the gas supply fails to shut off, do not turn off electrical power to the circulating pump. This may aggravate the problem and increase the likelihood of boiler damage. Instead, shut off the gas supply to the boiler at the gas service valve.

Table 12-1 : 926 Control Board ERROR Codes

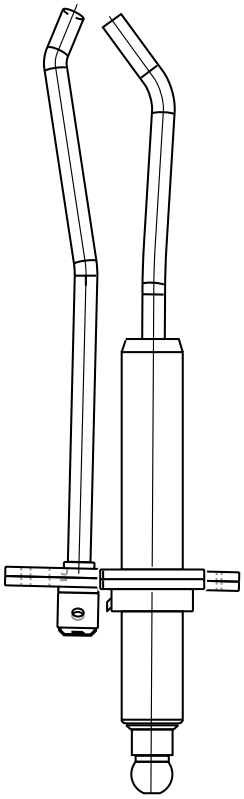
Code	Description	Corrective Action
E19	Line voltage frequency out of range.	Inspect power wiring to boiler and repair as necessary. If connected to line voltage, notify power company. If connected to alternate power source such as generator or inverter make sure line voltage frequency supplied by the device is 60 Hz
Flu	Blocked vent pressure switch	1. Assure that the flue is not blocked 2. Check the switch wiring by applying a jumper in place of the switch. If the code clears with the jumper in place REPLACE the flue switch and connect the wires to the new switch BEFORE running unit WARNING: Do not use jumper to remedy this error. Faulty switch MUST be replaced. Failure to do so could result in serious injury or death.
LEO	Water level in boiler is low.	1. Check boiler feed water system to be sure it is supplying make up water to boiler system. 2. Be sure all air is bled from the system. 3. Check for leaks in boiler and system piping and repair as necessary. 4. Inspect low level switch and wiring for damage and repair as necessary
LOU	24 volt low	1. Check line voltage. Must be between 100-128 volts. 2. If available, connect PC and using HTP service software check the 24v supply display in the lower left corner of the screen. The number displayed here must be greater than 128 and should be greater than 250. Use this as a troubleshooting guide as you follow the steps below. 3. Remove 10 pin Molex connector from customer connection board. If LOU code clears, then the problem is with external sensor wiring. Examine external sensor wiring for shorts to ground repairing as necessary. If LOU code is still present and the boiler is so equipped, disconnect high gas pressure switch, then low gas pressure switch, then UL 353 low water cutoff in this order one at a time to see if LOU code clears. Replace faulty part. Check low voltage wire harness in boiler for shorts to ground. 4. If LOU only occurs when burner tries to light, check gas valve for excessive current draw. 5. If LOU is present with the low voltage harness disconnected from the 926 control board, replace the 926 control board.
EO3	System sensor failure (Cascade Master only)	1. Check wiring to system sensor. Repair as necessary 2. Check sensor resistance. Compare to the table in Fig. 12-4 in manual. Replace if not correct.
FL	Low water flow (Users with optional flow switch only)	1. Check to see if boiler circulator is functioning. Repair as necessary. 2. Be sure water is flowing in the system. Check for valves that should be open, plugged filter screens, etc. 3. Check flow switch and wiring. Repair as necessary.

PART 12: TROUBLESHOOTING (CONTINUED)

Table 12-2: 926 Control Board FAULT Codes

Code	Description	Remedy
F00	High Temperature Limit Exceeded.	1. Check circulation pump operation 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermistor to the supply thermistor. 3. Check thermistor reading on supply thermistor. Replace switch if faulty. 4. Disconnect the two wires from the thermostat terminals and connect the wires together. Depress the S4/Reset button. If the fault clears, the problem is outside the boiler
F01	ECO circuit 2 Vent temperature High Gas Pressure (if equipped) Low gas pressure (if equipped) Low Level (if equipped with UL353 LWCO)	1. If the boiler is equipped with High and/or Low gas pressure switches, examine the switch(es) to see if the yellow LED is illuminated on the switch. If so, correct the gas supply problem associated with the switch and reset the switch by pressing on the cover of the switch over the red button to reset the switch. Pressing the button requires a firm push. Push the Reset button on the front panel of the boiler to reset the boiler control. 2. If the boiler has a UL353 LWCO, check to see if the red LED on the LWCO control box is illuminated. If so, correct the low water condition and press the reset button on the LWCO control box to reset the LWCO. The LED should change to green. Press the reset button on the front panel of the boiler to reset the boiler control. 3. Check the flue for obstructions or any sign of damage especially signs of excessive heat. Repair as necessary. Push red reset button on flue temperature switch located on the flue inside the rear access door of the boiler. NOTE: Switch temperature must be less than 90°F to reset. Run the boiler and check the flue temperature. If the flue temperature is within specs and the switch trips, replace the switch. If the flue temperature is excessive check and adjust combustion controls on the boiler. If problem persists, inspect the target wall in the combustion chamber and replace it if cracked or damaged.
F02	Interrupted or Shorted Supply (Outlet) Thermistor.	1. Check the electrical connection to the thermistor on the outlet manifold. Verify 5 VDC by checking in Molex connector. If no 5 VDC, check harness. If harness is OK, replace control. NOTE: Boiler will reset automatically. Verify thermistor values by referencing chart in this manual. 2. Replace thermistor if necessary.
F03	Interrupted or Shorted Return (Inlet) Thermistor.	1. Check the electrical connection to the thermistor on the inlet manifold. Verify 5 VDC by checking in Molex connector. If no 5 VDC, check harness. If harness is OK, replace control. NOTE: Boiler will reset automatically. Verify thermistor values by referencing chart in this manual. 2. Replace thermistor if necessary.
F05	Supply (Outlet) Temperature exceeds 230°F.	1. Check circulation pump operation. 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermistor to the supply thermistor. 3. Troubleshoot thermistor by following steps in F02
F06	Return (Inlet) Temperature Exceeded 230°F.	1. Check circulation pump operation. 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermistor to the supply thermistor. 3. Check direction of flow on boiler circulator. (See Piping Details in this manual.) 4. Troubleshoot thermistor by following steps in F02
F09	No flame detected – The boiler will make three attempts at ignition before the control goes into this lockout condition.	1. Watch the igniter through the observation window provided. 2. If there is no spark, check the spark electrode for the proper ¼" gap. Use 2 quarters together as a gauge to hold ignitor against to check gap distance. (See Fig. 12-3 in manual) 3. Remove any corrosion from the spark electrode and flame rectifier probe. 4. If there is a spark but no flame, check the gas supply to the boiler. 5. If there is a flame, check the flame sensor. 6. Check any flue blockage or condensate blocks.
F10	Loss of Flame Signal – The boiler will relight 4 times before the control goes into this lockout condition – Will reset automatically in 1 hour.	1. Monitor the gas pressure to the unit while in operation. 2. Assure that the flame is stable when lit. 3. Check to see if the green light on the display module is out while the boiler is running. 4. If the green light doesn't come on or goes off during operation check the flame signal on the status menu. 5. If the signal reads less than 1 microampere, clean the flame rectifier probe. 6. If the flame rectifier probe continues to read low, replace it. 7. Check the stability of the flame rectification signal. If the signal is unstable, you may need to replace the burner gasket.
F11	False Flame Signal – The boiler will lock out if it senses a flame signal when there should be none present.	1. Look into window. If there is flame, turn the gas off to the unit at the service valve and replace gas valve. 2. If the flame signal is present and there is no flame, replace the flame rectification probe. 3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection. 4. Remove the valve and check for obstruction in the valve seat or replace the gas valve. 5. Turn the gas on at the service valve after corrective action is taken. 6. Check for condensate back up. Condensate back up can damage the refractory wall, and if the wall falls against the rectifier probe, it may conduct the signal to ground, giving a false reading.
F13	Combustion Fan Speed too low or high – Boiler will lock out if it senses fan speed is less than 70% or greater than 130% of its expected rate for more than 60 seconds.	1. Check the combustion air fan wiring. 1a. Check the 24 VAC signal by measuring from any connected safety to ground. A low voltage situation may cause a "false" error code 2. Replace the combustion air fan. 3. Replace the control board.
F20	Condensate cup is full.	1. Check condensate lines for obstructions 2. Check float switch in condensate reservoir. 3. Check wiring from condensate reservoir to 926 control and repair as necessary
PP	Parameters Programmed	Press S4 reset for at least 1 second.
F31	Program Parameter Error	Control must be re-programmed. If programming does not solve problem, control must be replaced.

PART 12: TROUBLESHOOTING (CONTINUED)



NOTE: If receiving an F09 fault code, check the gap spacing between points on the electrode by holding two quarters together and sliding them through the gap. There should be a slight resistance.

Fig. 12-3

Resistance Table

System/Pipe Sensor Temperature Sensor 7250P-324	
Boiler Sensor (7250P-667)	Indirect/Tank Sensor (7250P-325)
Water Temperature (°F)	Resistance (ohms)
32	32550
41	25340
50	19870
59	15700
68	12490
77	10000
86	8059
95	6535
104	5330
113	4372
122	3605
131	2989
140	2490
149	2084
158	1753
167	1481
176	1256
185	1070
194	915
203	786
212	667

Fig. 12-4

PART 13: MAINTENANCE

A. MAINTENANCE PROCEDURES

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a qualified heating contractor for periodic maintenance of the heater. Installer must also inform the owner that the lack of proper care and maintenance of the heater may result in a hazardous condition.

⚠ WARNING

BEFORE EACH HEATING SEASON A trained and qualified service technician should perform the inspections as per the boiler inspection and maintenance schedule in the back of manual. Failure to do so could result in death or serious injury.

PART 13: MAINTENANCE (CONTINUED)

⚠ WARNING

The combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group1).":

- **Avoid breathing dust and contact with skin and eyes.**
  - **Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website at http://www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.**
  - **Wear long-sleeved, loose fitting clothing, gloves, and eye protection.**
- **Apply enough water to the combustion chamber lining to prevent dust**
- **Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.**

NIOSH stated First Aid.

- **Eye: Irrigate immediately**
- **Breathing: Fresh air.**

B. COMBUSTION CHAMBER COIL CLEANING INSTRUCTIONS FOR THE MOD CON

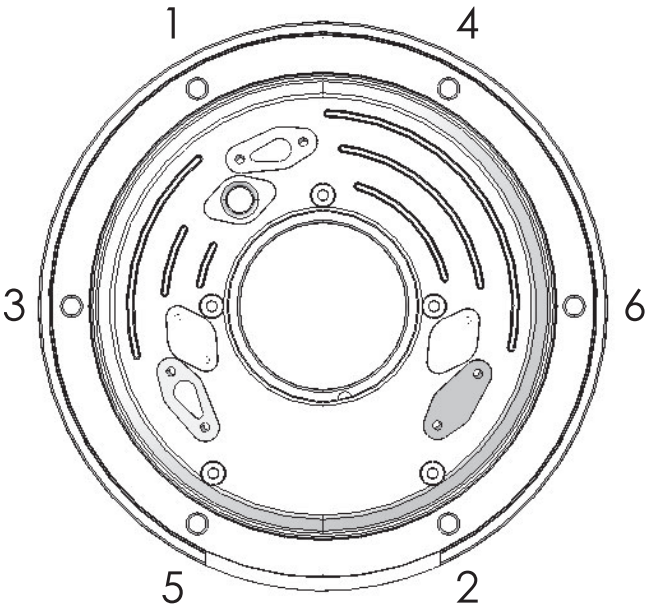
*Before beginning this procedure, you must have on hand the following items:

- a nylon, stainless steel or brass brush (not steel)
- "Rydlyme" (recommended for best results) (available on line www.rydlyme.com) or "CLR" (available at most hardware stores)
- Gloves, eye protection

1. Shut down the Mod Con Boiler by using the following steps:
   a. Close the gas valve, shut down the unit and wait for the unit to be cool to the touch
   b. Disconnect the condensate piping from the **outside** connection, **(not from the Mod Con Boiler side)**, so the flow from condensate reservoir can be observed.
   c. Disconnect electrical connections from the gas valve, spark electrode and flame rectification probe and combustion blower.
   d. Remove the (4) screws on the aluminum ¾" NPT connector on the right side of the gas valve.
   e. Disconnect the wiring connected to the combustion blower motor.
   f. Remove the (6) 10MM nuts from the burner plate assembly .
   g. Pull the entire burner plate assembly with blower still attached towards you, while removing or pushing aside any wiring to allow the removal of the assembly.
2. Using a spray bottle filled with the recommeded product "RYDLYME" or "CLR", spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate system. If the condensate system is blocked, let the chemical penetrate for at least 15 minutes or until it drains.
3. Use the nylon, stainless steel or brass brush (do not use steel) and scrub coils to remove any buildup, then vacuum the debris from the coils. WARNING: Follow precautions above
4. Spray the coils with clear water, making sure to confine the spray to the area being cleaned (Try to avoid getting the back ceramic wall of the unit wet). Flush the combustion chamber with fresh water until clear water runs from the condensate. At this point, the Mod Con should be ready to be re-assembled.
   a. Inspect gaskets.
   b. Re-install the burner assembly

PART 13: MAINTENANCE (CONTINUED)

d. Replace and tighten the (6) 10MM nuts to the burner plate using staggered tightening sequence. (See detail)



e. Re-connect all wiring connections

f. Inspect gas valve to assure O-ring is in place. Replace the (4) screws on the aluminum connector on the gas valve. Turn the gas back on. **(IMPORTANT: CHECK FOR GAS LEAKS)**

g. Turn the Mod Con Boiler power back on and create a demand on the boiler. When boiler is lit, observe condensate flow from the boiler. Be sure the boiler is operating properly.

h. Re-connect the condensate piping to the outside condensate connection.

C. MAINTENANCE PROCEDURE TO CLEAN HEAT EXCHANGER:

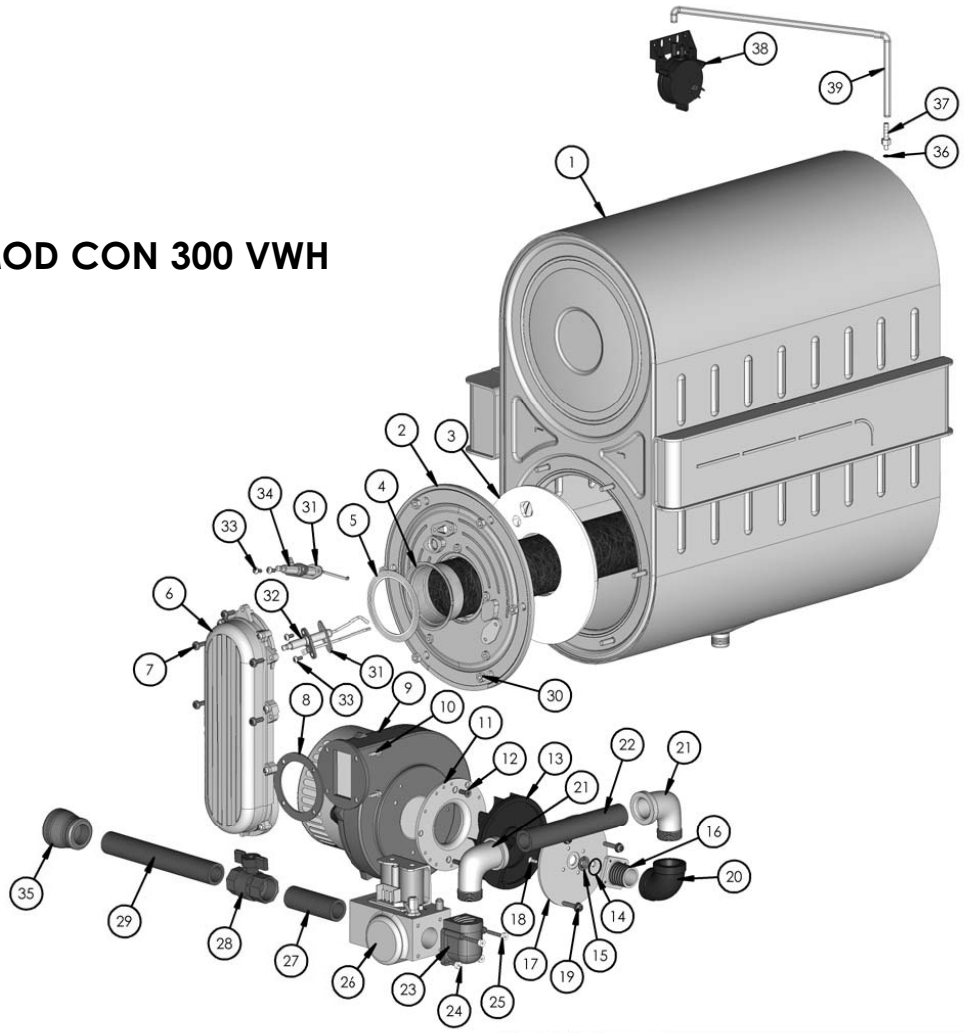
1. Shut off power to the boiler.
2. Close ball valves on both inlet and outlet of the heater.
3. Attach a hose to both the drain valves located on the inlet and outlet. Feed both hoses into a plastic bucket. Let heater cool down to room temperature before opening both drain valves. Please note the amount of water content in each unit varies – see chart:
   Mod/Con 300 – 2.9 gallons water
   Mod/Con 500 – 4.2 gallons water
   Mod/Con 850 – 5.8 gallons water
4. Next pour lime scale remover into the bucket – Rydlyme* is an approved scale remover that is FDA-approved, and when circulated through the heater for a period of time, will clean scale and improve the heater's performance. It is important to follow the manufacturer's instructions on the lime scale remover.

* **NOTE: It is important to note that cleaners used that are not compatible with stainless steel and not FDA-approved are not recommended and will void the boiler's warranty.**

5. Circulate scale remover through boiler and flush heat exchanger with clean potable water.
6. After flushing the heater, remove hose and close both the inlet and outlet drain valves securely.
7. Open ball valves slowly and open a hot water tap water to remove any excess air that may still be in the heat exchanger.
8. Turn power back on to the boiler and verify proper operation of boiler.

PART 13: MAINTENANCE (CONTINUED)

MOD CON 300 VWH



Item No	Replacement Part #	Description
1	7350P-005	300,000 BTU MOD CON MODULE
2	7350P-016	BURNER DOOR
3	7350P-018	BURNER DOOR REFRACTORY
4	7350P-031	BURNER
5	7500P-074	GASKET - BURNER
6	7250P-687	AIR CHANNEL
7	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
8	7500P-075	GASKET - AIR CHANNEL/BLOWER
9	7350P-159	COMBUSTION BLOWER
10	7350P-119	M5 X 12MM HEX CAP SCREW - BLOWER
11	7250P-711	FAN ADAPTER PLATE
12	N/A	M5 X 8MM FLAT HEAD PHILLIPS SCREW
13	7250P-712	SWIRL PLATE 16MM
14	7350P-121-3	GAS INJECTOR PLATE O-RING
15	7350P-121-4	GAS INJECTOR
16	7350P-121-2	3/4" NPT ADAPTER
17	7350P-121-1	GAS INJECTOR PLATE
18	7350P-121-5	M4 X 10MM FLAT HEAD SLOTTED SCREW

Item No	Replacement Part #	Description
19	7350P-617	M4 X 35MM SCREW
20	7350P-083	ELBOW,BLK,3/4" NPT,SCH40,90 DEG
21	7350P-084	3/4" x 3/4" NPT STREET ELBOW
22	7350P-118	3/4" NPT X 6" NIPPLE - PHOSPHATE COATED
23	7250P-723	3/4" RIGHT ANGLE CONNECTOR
24	N/A	M5 X 12MM SOCKET HEAD SCREW
25	N/A	M5 X 25MM SOCKET HEAD SCREW
26	7350P-121	GAS VALVE - 253483
27	7350P-080	3/4" NPT X 3" NIPPLE - PHOSPHATE COATED
28	7350P-079	3/4" GAS BALL VALVE
29	7350P-074	3/4" NPT X 7" NIPPLE - PHOSPHATE COATED
30	7500P-067	M6 NUT - BURNER DOOR
31	7250P-005	GASKET - PROBE/ELECTRODE
32	7350P-020	SPARK ELECTRODE (w/GASKET)
33	7250P-069	M4 X 8MM S.S. SCREW - PROBE/ELECTRODE
34	7350P-022	FLAME RECTIFICATION PROBE (w/GASKET)
35	7350P-122	3/4" X 1-1/4" NPT REDUCING COUPLING BLK. IRON
36	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
37	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32
38	7250P-150	BLOCKED VENT PRESSURE SWITCH
39	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"

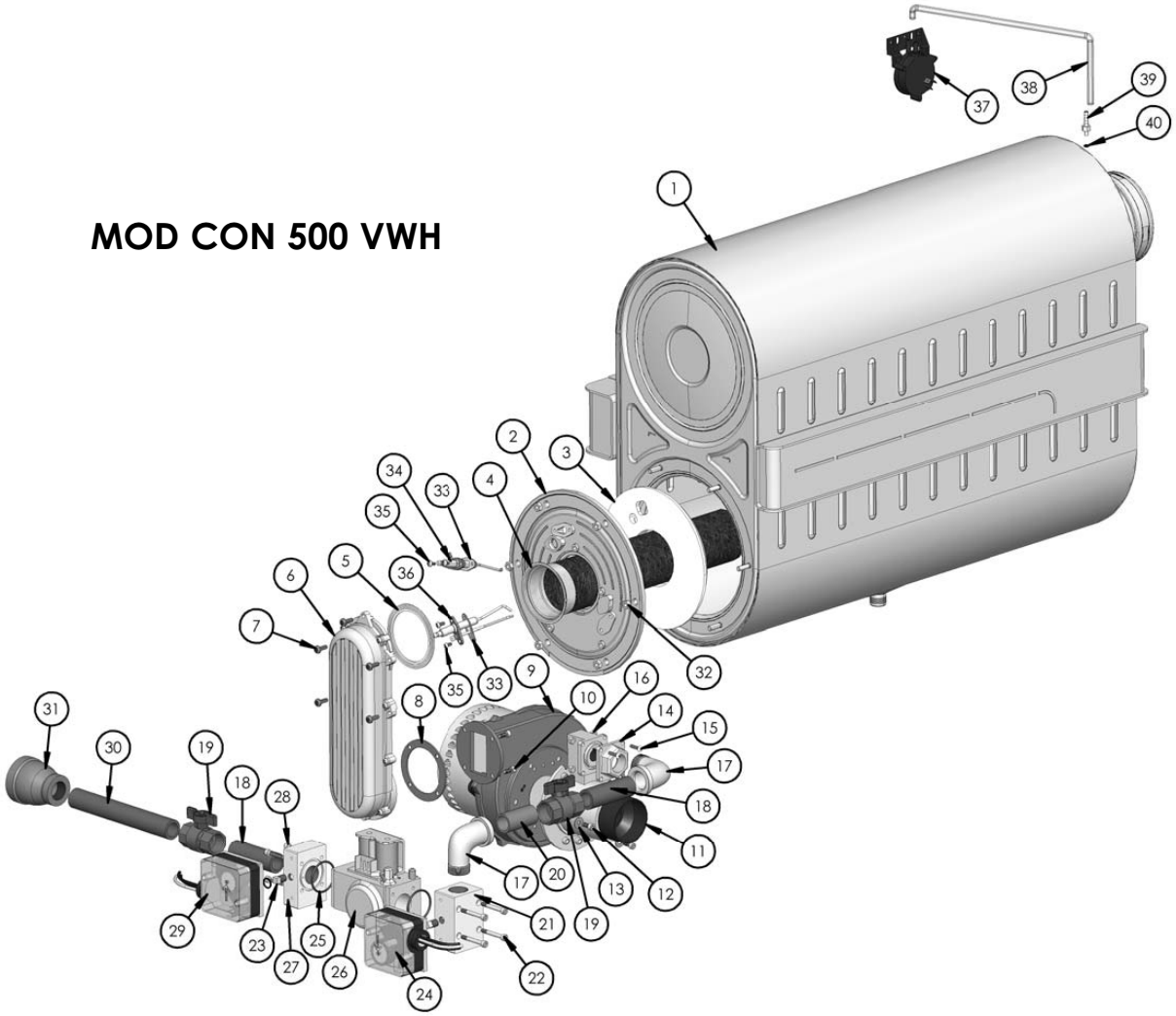
05-A
4/09

Fig. 13-1

LP-205-A
REV. 8/24/09

PART 13: MAINTENANCE (CONTINUED)

MOD CON 500 VWH



ITEM NO.	Replacement Part #	Description
1	7350P-006	500,000 BTU MOD CON MODULE
2	7350P-016	BURNER DOOR
3	7350P-018	BURNER DOOR REFRACTORY
4	7350P-031	BURNER - GCFI
5	7500P-074	GASKET - BURNER
6	7250P-687	AIR CHANNEL
7	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
8	7500P-075	GASKET - AIR CHANNEL/BLOWER
9	7350P-159	COMBUSTION BLOWER
10	7250P-478	M5 X 12MM SOCKET CAP SCREW
11	7350P-161	HONEYWELL VENTURI
12	7250P-477	M5 X 16MM SOCKET CAP SCREW
13	N/A	5MM FLAT WASHER
14	7350P-163	HONEYWELL VENTURI ADAPTER
15	N/A	M5 X 16MM ROUND HEAD SLOTTED SCREW
16	N/A	M5 NUT
17	7350P-084	3/4" M x 3/4" F NPT STREET ELBOW
18	7350P-080	3/4" NPT X 3" NIPPLE - PHOSPHATE COATED
19	7350P-079	3/4" GAS BALL VALVE
20	7350P-102	3/4"NPT x 2" NIPPLE - PHOSPHATE COATED

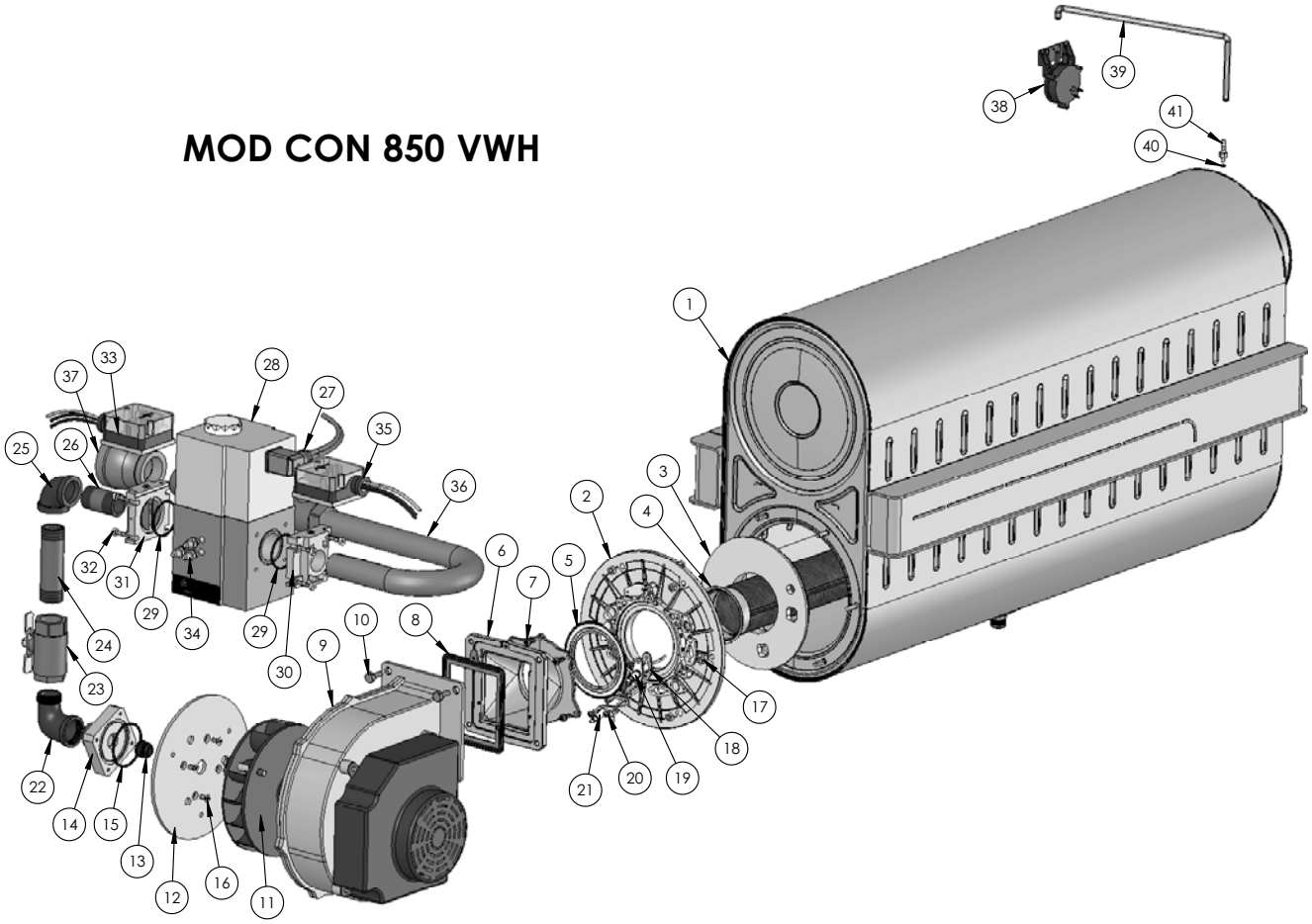
ITEM NO.	Replacement Part #	Description
21	7350P-091	GAS VALVE ADAPTER BLOCK - RIGHT
22	7350P-111	10-32 X 1-1/2" SS SOCKET CAP SCREW - ADAPTER BLOCK RIGHT
23	7350P-078	1/8-27" NPT PLUG - FLANGES
24	7350P-035	HIGH GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)
25	7350P-077	SILICONE O-RING #127 - ADAPTER BLOCK TO GAS VALVE
26	7350P-033	GAS VALVE
27	7350P-075	GAS VALVE ADAPTER BLOCK - LEFT
28	7250P-061	M5 X 25MM S.S. SOCKET CAP SCREWS - ADAPTER BLOCK LEFT
29	7350P-036	LOW GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)
30	7350P-074	3/4" NPT X 7" NIPPLE - PHOSPHATE COATED
31	7350P-110	3/4" X 1-1/2" NPT REDUCING COUPLING BLK. IRON
32	7500P-067	M6 NUT - BURNER DOOR
33	7250P-005	GASKET - PROBE/ELECTRODE
34	7350P-022	FLAME RECTIFICATION PROBE (w/GASKET)
35	7250P-069	SCREW M4 X 8MM - PROBE/ELECTRODE
36	7350P-020	SPARK ELECTRODE (w/GASKET)
37	7250P-150	BLOCKED VENT PRESSURE SWITCH
38	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"
39	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32
40	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING

Fig. 13-2

LP-205-V
REV. 8/24/09

PART 13: MAINTENANCE (CONTINUED)

MOD CON 850 VWH



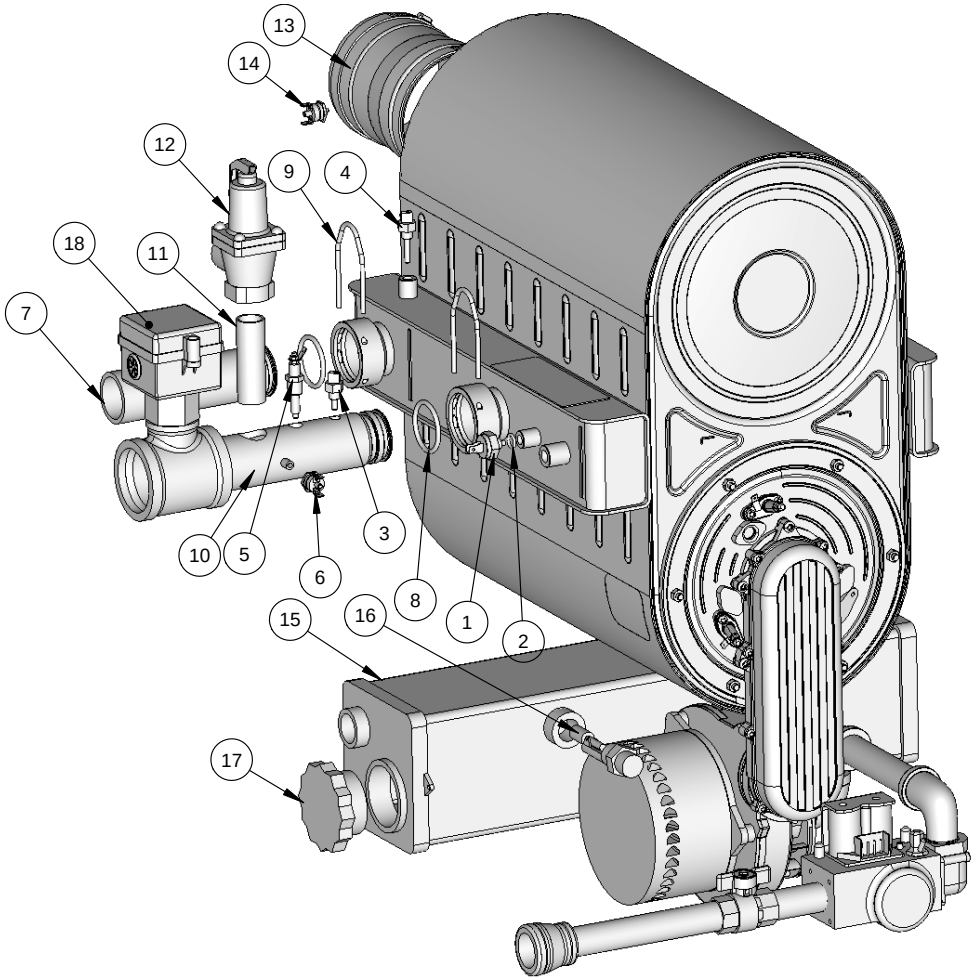
Item No	Replacement Part #	Description
1	7350P-007	850,000 BTU MOD CON MODULE
2	7350P-017	BURNER DOOR
3	7350P-019	BURNER DOOR REFRACTORY
4	7350P-037	BURNER
5	7350P-028	GASKET - BURNER
6	7350P-029	AIR/GAS CHANNEL - CONICAL
7	7350P-030	SCREW - AIR CHANNEL TO BURNER DOOR
8	7350P-064	INTERFACE GASKET - AIR CHANNEL/BLOWER
9	7350P-038	COMBUSTION BLOWER
10	7350P-093	M8 X 20MM HEX HEAD BOLT - BLOWER
11	7350P-034-1	SWIRL PLATE (includes item #12)
12	N/A	MOUNTING PLATE
13	7350P-034-4	12MM GAS INJECTOR
14	7350P-034-2	BLOWER ADAPTER FLANGE (includes items #15 & 16)
15	N/A	O-RING - BLOWER ADAPTER FLANGE
16	N/A	M6 X 25MM FLAT HEAD SCREW - ADAPTER FLANGE
17	7500P-067	M6 NUT - BURNER DOOR
18	7250P-005	GASKET - PROBE/ELECTRODE
19	7350P-023	FLAME RECTIFICATION PROBE (includes item #18)
20	7250P-069	M4 X 8MM S.S. SCREW - PROBE/ELECTRODE

Item No	Replacement Part #	Description
21	7350P-021	SPARK ELECTRODE (includes item #18)
22	7350P-096	1" X 1" STREET ELBOW - SCH. 40
23	7350P-099	1" GAS BALL VALVE
24	7350P-097	1" NPT X 4" NIPPLE - PHOSPHATE COATED
25	7350P-095	1" NPT 90 DEGREE ELBOW
26	7350P-098	1" NPT X 3" NIPPLE - PHOSPHATE COATED
27	7350P-034-8	HIRSCHMAN CONNECTOR
28	7350P-034	GAS VALVE (includes items #29 & 31)
29	N/A	O-RING - FLANGE
30	7350P-034-5	1" NPT FLANGE
31	7350P-034-3	MAXIMUM FLOW RESTRICTOR FLANGE
32	N/A	M6 X 25MM SCREWS - FLANGE
33	7350P-035	HIGH GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)
34	7350P-034-6	AIR ADJUSTMENT PORT
35	7350P-036	LOW GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)
36	7350P-082	GAS PIPE ASSY W/SHUT-OFF 1-1/4 IPS X 1 IPS
37	7350P-109	1-1/4" - 2" REDUCING COUPLING
38	7250P-150	BLOCKED VENT PRESSURE SWITCH
39	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"
40	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
41	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32

Fig. 13-3

LP-205-S
REV. 6/5/08

PART 13: MAINTENANCE (CONTINUED)

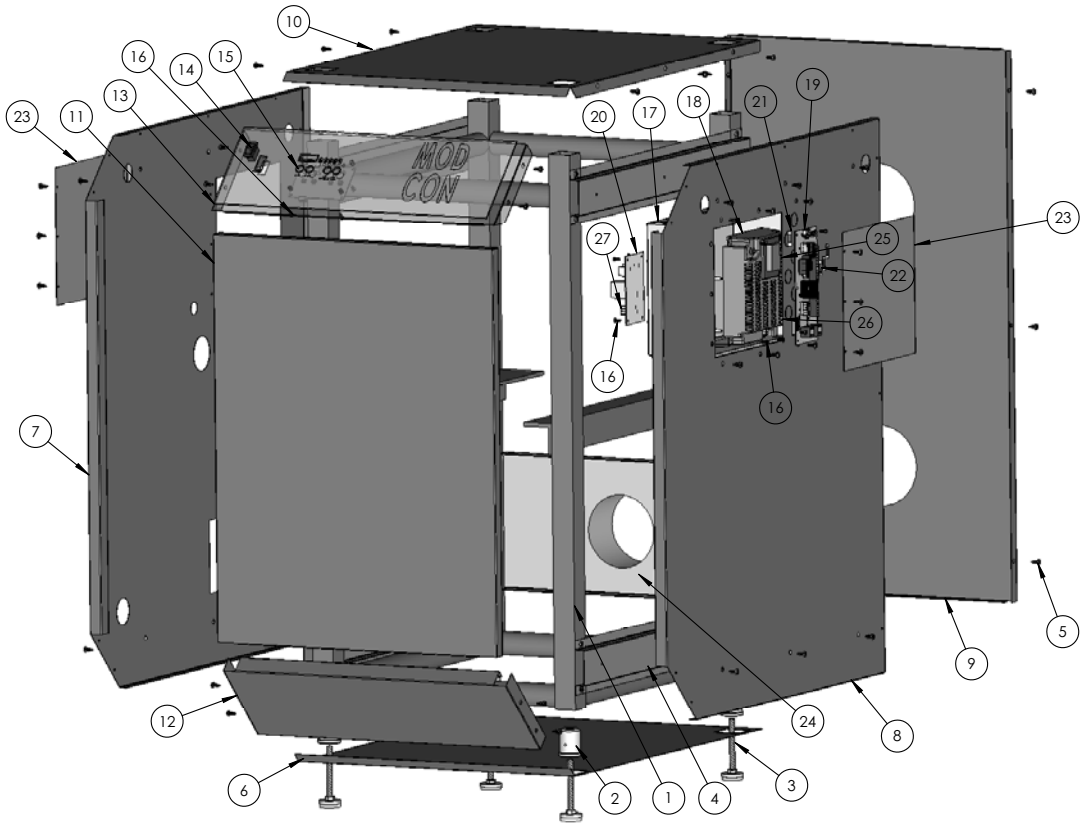


ITEM	MOD CON 300VWH*	MOD CON 500VWH*	MOD CON 850VWH*	DESCRIPTION
1	7500P-033	7500P-033	7500P-033	ECO HIGH LIMIT SENSOR(W/O-RING)
2	7500P-100	7500P-100	7500P-100	O-RING-ECO HIGH LIMIT SENSOR
3	7250P-059	7250P-059	7250P-059	THERMISTOR -SYSTEM SUPPLY
4	7250P-667	7350P-667	7350P-667	THERMISTOR - SYSTEM RETURN
5	7350P-089	7350P-089	7350P-089	LOW WATER CUT-OFF PROBE
6	7500P-002	7500P-002	7500P-002	ECO SWITCH-190 DEGREES
7	7350P-003	7350P-004	7350P-004	1-1/2INLET NIPPLE(W/O-RING)(300 ONLY) 2" INLET /NIPPLE(W/O-RING)
8	7350P-071	7350P-072	7350P-072	O-RING- INLET/OUTLET NIPPLE
9	7350P-014	7350P-015	7350P-015	1-1/2" INLET/OUTLET NIPPLE CLIP(300 ONLY) 2" INLET NIPPLE CLIP
10	7350P-001	7350P-002	7350P-002	1-1/2" OUTLET NIPPLE (W/O-RING)(300 only) 2" OUTLET NIPPLE(W/O-RING)
11	SN1018	SN1018	SN1018	3/4"NPT X 3" NIPPLE - BRASS
12	7350P-065	7350P-065	7350P-065	150# RELIEF VALVE=3/4" NPT
13	7250P-733	7250P-733	7350P-094	Z-FLEX EXHAUST ADAPTOR FOR PVC
14	7250P-739	7250P-739	7250P-739	FLUE ECO SWITCH - 160 DEGREES
15	7350P-613	7350P-613	7350P-613	CONDENSATE COLLECTOR ASSEMBLY
16	7350P-167	7350P-167	7350P-167	CONDENSATE OVERFLOW SWITCH
17	7350P-113	7350P-113	7350P-113	2" PVC PLUG
18	7350P-606	7350P-605	7350P-605	FLOW SWITCH KIT FOR MOD CON VWH (Includes Brass Tee)

Fig. 13-4

LP-276-F
REV. 10/28/09

PART 13: MAINTENANCE (CONTINUED)



Item No	MOD CON 300 VWH*	MOD CON 500 VWH*	MOD CON 850 VWH*	Description
1	7350P-039	7350P-040	7350P-041	MOD CON FRAME
2	7350P-092	7250P-092	7350P-092	LEVELING FOOT SUPPORT
3	7250P-673	7250P-673	7250P-673	LEVELING FEET KIT
4	7350P-067	7250P-068	7250P-069	JACKET MOUNTING BRACKET
5	7350P-063	7350P-063	7350P-063	#10 x 1/2" THREAD CUTTING SCREW - JACKET
6	7350P-059	7350P-060	7350P-061	JACKET - BOTTOM (w/SCREWS)
7	7350P-053	7350P-055	7350P-057	JACKET - LEFT SIDE (w/SCREWS)
8	7350P-054	7350P-056	7350P-058	JACKET - RIGHT SIDE (w/SCREWS)
9	7350P-049	7350P-049	7350P-126	JACKET - REAR (w/SCREWS)
10	7350P-050	7350P-051	7350P-052	JACKET - TOP (w/SCREWS)
11	7350P-047	7350P-047	7350P-047	JACKET - FRONT (w/SCREWS)
12	7350P-048	7350P-048	7350P-048	JACKET - LOWER FRONT (w/SCREWS)
13	7350P-046	7350P-046	7350P-046	JACKET - UPPER FRONT (w/MOD CON LABEL, SCREWS)
14	7500P-087	7500P-087	7500P-087	POWER SWITCH
15	7350P-009	7350P-009	7350P-009	926 DISPLAY PANEL w/RIBBON CABLE
16	7500P-115	7500P-115	7500P-115	6-32 X 1/4" PAN HEAD SCREW - DISPLAY/BOARDS
17	7350P-042	7350P-042	7350P-042	ELECTRICAL BOX
18	7350P-008	7350P-008	7350P-008	926 CONTROL BOARD
19	7350P-070	7350P-070	7350P-070	FIELD CONNECTION BOARD
20	N/A	N/A	7250P-580	RELAY BOARD (850 ONLY)
21	7250P-378	7250P-378	7250P-378	FUSE - CONTROL BOARD
22	7350P-129	7350P-129	7350P-129	FUSE - CONNECTION BOARD - 3.15 AMPS
23	7350P-062	7350P-062	7350P-062	ELECTRICAL BOX/ACCESS PANEL COVER
24	7350P-103	7350P-103	7350P-104	AIR INLET BRACKET
25	7350P-025	7350P-026	7350P-043	120V WIRING HARNESS (LOCATION)
26	7350P-024	7350P-044	7350P-045	LOW VOLTAGE WIRING HARNESS (LOCATION)
27	N/A	N/A	7350P-012	BLOWER WIRING HARNESS (LOCATION)

***LP DENOTES PROPANE GAS / HL DENOTES HIGH/LOW GAS PRESSURE SWITCH.**

Fig. 13-5

LP-205-B
REV. 10/28/08

BOILER START UP REPORT

Light Off Activities		Date completed _____			
1) Fill the heating system	Check all piping and gas connections, verify they are all tight				
	Pressurize System	____PSI			
	Add Water to prime condensate system				
		___%			
	Verify near heater piping and flue are properly supported				
2) Check Gas Pipe	Leak test using locally approved methods (consult jurisdictional code book)				
	Check incoming gas pressure (3.5" to 14" W.C.)	___in w.c.	Static		
	What is the "drop" on light off (No more than 1" W.C.)	___in w.c.	Dynamic		
3) Record Ionization Current	Check µA reading at d7 on the status menu (see start-up section)	___ µA	High Fire	___ µA	Low Fire
4) Verify System Operation	Turn up aquastat on storage tank to verify wiring connections				
5) Check Combustion	Check and adjust (if necessary) carbon dioxide content	___% CO2	High Fire	___%CO2	Low Fire
	Check and adjust (if necessary) carbon monoxide content	___ppm CO	High Fire	___ppm CO	Low Fire
		___*8	___*9	___*10	___*11
System Setting	Verifty system settings	___de	___dh		
	Check Mixing Valve				
Notes:					

BOILER INSPECTION AND MAINTENANCE SCHEDULE

Inspection Activities		Date last completed			
Piping		1st Year	2nd Year	3rd Year	4th Year*
Near Heater Piping	Check heater and system piping for any sign of leakage, verify proper support				
Vent	Check condition of all vent pipe and joints and supports. Note any deterioration and replace.				
Gas	Check gas piping, test for gas leaks and signs of aging, make sure all pipes are supported properly.				
System					
Visual	Do a full visual inspection of all system components. Pay close attention to clearances of venting. Make sure intake and exhaust screens are clean and clear of obstructions.				
Functional	Test all functions of the system (Heat, Set Point, Safeties)				
Temperatures	Verify safe settings on Super-Stor storage tank or Anti-Scald Valve (see part 12 for related safety warnings)				
Electrical					
Connections	Check wire connections, make sure they are tight				
Circuit breakers	Check to see that the circuit breaker is clearly labeled, exercise circuit breaker				
Switch and Plug	Verify ON/OFF switch and convenience plug are both functional				
Smoke and CO detector	Verify devices are installed and working properly, change batteries if necessary				
Chamber and Burner					
Combustion Chamber	Vacuum Debris from Combustion Chamber if Necessary				
Combustion Chamber	Check burner tube, and combustion chamber coils, clean according to maintenance section of manual. See procedure to clean heat exchanger Part 13.				
Spark Electrode	Clean with Scotch Brite pad, Set gap at 1/4" (see Fig 14-2 Part 14 in Troubleshooting section)				
Flame Probe	Clean with Scotch Brite pad, Check flame current in µA (d7 on status menu in Start-up Procedures) record high fire (7-9 typical) and low fire (2-6 typical)				

* NOTE : CONTINUE MAINTENANCE BEYOND THE 4TH YEAR IS REQUIRED ON A YEARLY BASIS.

BOILER INSPECTION AND MAINTENANCE SCHEDULE (CONTINUED)

Inspection Activities		Date last completed			
Condensate		1st Year	2 Year	3 Year	4 Year*
Condensate Neutralizer	Check condensate neutralizer, making sure there is a sufficient quantity. Replenish if necessary.				
Condensate System	1. Check entire condensate system making sure there are no obstructions in the flow 2. Make sure the condensate pump is working property, verify all connections. 3. Clean out condensate neutralizer, use Wet / Dry Vacuum. Check for all potential obstruction issues. Replenish marble chips or lime crystals if needed (no smaller than ¾") Refill system with water WARNING: You must verify flow of condensate and make sure the cap is connected properly before leaving boiler unattended.				
Gas					
Pressure	Measure incoming gas pressure (from 3.5" to 14" W.C.)				
Pressure Drop	Measure drop in pressure on light off (no more than 1" W.C.)				
Check gas pipe for leaks	Check piping for leaks, and verify they are all properly supported				
Combustion					
Check CO/CO2 Levels	Check levels of CO and CO2 in Exhaust (See Start Up section, Part 10, Fig. 10-1 for ranges) record at high and low fire				
Safeties					
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO, replace if corroded				
Thermistors	Check wiring, verify through ohms reading (see chart part 14 Fig. 14-3)				
Final Inspection					
Check List	Verify that you have completed the entire check list WARNING: FAILURE TO DO SO COULD RESULT IN DEATH OR SERIOUS INJURY.				
Owner	Review with the owner what you have done				
		INIT	INIT	INIT	INIT
Tech Sign Off		DATE	DATE	DATE	DATE

* NOTE : CONTINUE MAINTENANCE BEYOND THE 4TH YEAR IS REQUIRED ON A YEARLY BASIS.

ADDITIONAL INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

In the Commonwealth of Massachusetts, the installer or service agent shall be a plumber or gas fitter licensed by the Commonwealth.

When installed in the Commonwealth of Massachusetts or where applicable state codes may apply; the unit shall be installed with a CO detector per the requirements listed below.

5.08: Modifications to NFPA-54, Chapter 10

(1) Revise NFPA-54 section 10.5.4.2 by adding a second exception as follows:

Existing chimneys shall be permitted to have their use continued when a gas conversion burner is installed, and shall be equipped with a manually reset device that will automatically shut off the gas to the burner in the event of a sustained back-draft.

(2) Revise 10.8.3 by adding the following additional requirements:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the service of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW, KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2)(a) 1 through 4.

(b) EXEMPTIONS: the following equipment is exempt from 248 CMR 5.08 (2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required to be Vented" in the most current edition of NFPA 54 as adopted by the Board; and

2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and

2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approval side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

MAINTENANCE NOTES

MAINTENANCE NOTES

MAINTENANCE NOTES

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